Chapter 3: The Affected Environment

This chapter provides a concise description of the project area and the resources that would be affected by actions proposed under the various alternatives.

Background on Whiskeytown National Recreation Area

Whiskeytown National Recreation Area is located in northern California in Shasta County, 85 miles inland from the Pacific Ocean, and eight miles west of the city of Redding, California that has a population of 80,000. The recreation area can be reached from both the east and west by California State Route 299. The park covers 42,503 acres, approximately 70 square miles, and includes the 3,220- acre Whiskeytown Lake. Whiskeytown Lake lies at the confluence of seven perennial streams that form one of the largest watersheds of the Sacramento River, and provides drinking water for several municipalities. Nearly six million people live within a day's drive of the park.

The enabling legislation of Congress that established Whiskeytown National Recreation Area on November 8, 1965, under Public Law 89- 336 provided specific responsibilities for management of the park. The park was created to

> "*provide…for the public outdoor use and enjoyment…by present and future generations, and for the conservation of scenic, scientific, historic, and other values contributing to public enjoyment of such lands and water*."

Whiskeytown was created to provide for recreational opportunities and protection and conservation of natural and cultural resources. The mandate derived from the National Park Service Organic Act of 1916 outlines the fundamental purposes of the National Park System, and directs the National Park Service to allow for public use and enjoyment provided that the resources therein remain unimpaired for future generations. The conservation of natural and cultural resources takes primacy over the provision of recreation.

Most of the park's 46- mile boundary is bordered by private land, with some bordering lands administered by the Bureau of Land Management. There is one state- owned tract of 29 acres and six private tracts totaling 15 acres within the park. Elevations in the park range between 625 feet at the southern end of lower Clear Creek to 6,209 feet at the summit of Shasta Bally. The park provides many varied habitats for a unique and diverse assemblage of plant and wildlife species.

Climate

The park is in an area of Mediterranean climate with hot, dry summers, and cool winters with moderate rainfall. At the lower elevations, temperatures over 100° F often occur during the months of May through September, with occasional sub- freezing temperatures from November through March. The frost- free growing season averages 250 days at the lower elevations (Biek 1988). The mean annual temperature is 58° F, as recorded at the weather station located at The park headquarters. Reliable measurements of temperature at higher elevations are not available, but distinctly cooler temperatures at found at higher elevations. The average annual precipitation at park headquarters is 60 inches, nearly all in the form of rain. The south side of the lake receives higher total rainfall than the north side. Seventy- five to ninety percent of the total annual rainfall

occurs between November 1st and April 30th. Reliable figures on snowfall are not available; however, snow often remains at the higher elevations well into June.

Fire history

Fire has long been recognized as a major ecological process in the development and maintenance of California ecosystems. Disturbances such as fire and the frequency, intensity, duration, and extent at which they occur, can have a profound effect on species diversity within and among communities (Rosenzweig 1995). Ecosystems are currently defined by the processes that regulate them (Christensen et. al 1989), and land managers now recognize that it is imperative to take disturbance regimes into account in order to maintain natural ecosystems (Agee 1993). Improvement and maintenance of ecosystem health meets one of the fire management program goals discussed at the beginning of Chapter One.

Located between the Cascade Range, Coast Range, and Sacramento Valley, Whiskeytown National Recreation Area is an area of significant diversity. The park's several plant communities and species diversity reflect a broad range in elevation, rugged topography, and diverse soil types. The historic fire regimes of Whiskeytown are complicated due to these extremes in topography and an extensive history of anthropomorphic disturbance. What makes describing these regimes even more complicated is that there is a general lack of information on the historical fire regimes of the Klamath Mountains.

Rising up from the Sacramento foothills, Whiskeytown's lower elevations are primarily comprised of chaparral, knobcone pine, and mixed oak woodlands with scattered ponderosa pines. Little is known about the fire history of these plant communities in Whiskeytown. According to the literature, oak woodlands usually are characterized by fast- moving fires of low severity. On the other hand, chaparral and knobcone pine communities usually support severe fires that kill aboveground portions of the plants. Fires within the chaparral and knobcone pine plant communities are characterized by fast moving and intense fires. Fire return intervals in chaparral and knobcone pine are quite variable, depending on local site conditions. These return intervals have been estimated to range between twenty to fifty years, with ranges of approximately ten to more than a hundred years (Keeley 1982). The historic occurrence of fires in the chaparral and knobcone communities are also considered to be infrequent because these crown fire species are subject to immaturity risk, which means that repeated fire would convert the community to one of frequent surface fires. This would most likely be annual grasslands or chamise, given the elevation, slope, and soil types that they exist in now. Other evidence includes recent reports that clearly show knobcone pine and other serotinous species such as McNab cypress in Whiskeytown before the lake was filled. As a matter of fact, Whiskeytown supported the largest population of McNab cypress in California. Heat sensitive serotinous species such as knobcone pine and McNab cypress do not survive in areas that have frequent fire. Therefore, their presence indicates a fire regime of infrequent fire in the lower elevations.

On the other hand, mixed oak woodlands have a fire history of burning frequently with fires generally of low to moderate severity. Historical fire return intervals in these areas were generally from two to eight years. In Whiskeytown, chaparral and knobcone pine are primarily found on south- facing slopes, and the oak woodlands are found on in riparian areas and north- facing slopes. The combination of their fire regimes makes up a "mixed fire regime" in which fast-moving and intense crown fires would race up south- facing and sun- exposed slopes. These fires then become an understory fire as they would back down the north- facing slopes and more mesic riparian areas.

Higher in elevation towards the top of Shasta Bally, ponderosa pine and mixed oak woodlands dominate on the north- facing slopes, and begin to blend with mixed conifer forests above 3,000 feet. The fire return intervals for these plant communities range from 3 to 50 and are usually associated with frequent fires of low to moderate severity. These frequent, low- intensity fire regimes greatly reduced the ground fuels and vegetation with only minimal impacts to the overstory trees, and typically promoted a diverse herbaceous and shrub understory layer. Increased fuel loads correlate to higher severity fires and more pronounced fire impacts, although individual and species- specific responses do prevail. Specifically, median fire return intervals for seven mixed conifer and ponderosa pine forest sites were seven to fifteen years, with a range of three to fifty five years (Skinner in prep.). However, the fire regime can vary considerably in both frequency and pattern of severity by topography, site quality, vegetation and other local factors (Skinner and Chang 1996)

To address the variability within fire regimes, a recent analysis of fire in the Klamath National Forest (Odion et al. in prep) found that long- unburned forests tended to burn at low severity and that the highest fire severity occurred in areas burned on relatively short (10- 20 year) rotations. The latter effect was likely due to management practices (post- fire logging, plantation establishment) that do not apply to the park. However, this research does support other recent research (e.g. Keeley et al. 1999b, Bessie and Johnson 1995, Johnson et al. 2001) indicating that wildland fires are not necessarily more extreme now than ever before due to fire suppression. The unnatural fuel- buildup idea applies to ponderosa pine forests of the interior west, where surface fire historically maintained open forests, which have now become prone to crown fires because of changes in fuel loading and arrangement without fire (Covington 2000). There is little or no good evidence to support this model in many other ecosystems (Anderson et al. 1999), but it has nonetheless been widely applied. Gutsell et al. (2001) suggest that managers should demand convincing evidence of a crown fire regime before embarking on thinning treatments that are, evolutionarily, clearly unprecedented.

Dendrochronology can tell us how frequently trees have been scarred by fire as far back as tree ring records go, but there are no such records for reconstructing how much crown fire was natural in this landscape. The amount of crown fire and fire return interval likely varied considerably in this area with its sharp gradients and steep topography. Crown- fires, although hazardous and undesirable in other respects to humans, did occur naturally, and are not necessarily harmful biologically. Overall diversity may be promoted through the creation of snags, important for wildlife, and other impacts of opening up forests. Chaparral and knobcone pine communities are crown fire dependent. Chaparral may have naturally occurred in areas with forest potential after high severity fire, forming a shifting mosaic, promoting diversity, and restoring productivity to these areas via nitrogen- fixing shrubs and mycorrhizal facilitation of forest redevelopment. Large, old trees such as ponderosa pine and Douglas fir may escape damage in fires of mixed severity with scattered crown fire because these trees become fire resistant or because fire, by nature, can be highly variable.

As this body of research indicates, fire return intervals and severity in this region are highly variable. This variation may be important in promoting the rich biodiversity the region is renowned for (Taylor and Skinner 1998). However, fire history studies show that natural ignitions alone do not account for historic fire frequency in mixed conifer forests, which points to a significant fire incidence from Indian burning (Kilgore and Taylor 1979). All California Indian tribes used fire as a tool to control brush, drive game, collect insects, obtain preferred basketry materials, or promote the growth of seed- producing plants. (Sturtevant 1978, Lewis 1973, Anderson 1993, Anderson 1999). The effect of Native American fire use is “so important that it has left its mark upon most every vegetation type in California.” (Anderson 1993).

Prior to European settlement, lightning strikes were the principal source of natural ignitions of forest fires (Agee 1993). Although Whiskeytown has accurate records of fire starts dating back only 30 years, it is quite likely that most lightning strikes in Whiskeytown historically occurred in the mid- elevation, and resulted in surface fires until they hit major topographic barriers. Most fires in the Klamath Mountains are bounded by permanent watercourses and ridge tops that act as major barriers. Less than one lightning strike per year resulted in a wildland fire from the 25 lightning strikes recorded from 1969 to 1998. Lightning strikes account for 90.8% of the wildland fire acreage burned in the park since 1969. Most of the lightning- ignited fires in the park since 1983 were located on the upper one- third of north and east- facing 26- 40% slopes in the lower elevations (1500- 2500 feet) (Figure 3- 1). Recent historical fire information has been reconstructed through California Department of Forestry and National Park Service spot maps and fire history reports, and dendrochronology studies, although in- depth fire history information specific to Whiskeytown is not available. California Department of Forestry and National Park Service spot maps show that since 1929 a size class C (10- 99 acres) wildland fire occurred in the park on an average of every 4.5 years, and a size class F (1000- 5000 acres) wildland fire occurred on an average of every 13.75 years.

Current Conditions

Whiskeytown's complex history of natural and anthropomorphic disturbance, diverse plant communities and fire regimes are testament for a multi- faceted approach to fire management. A combination of logging and fire suppression in Whiskeytown's ponderosa pine and mixed conifer forests has created dense, homogeneous stands of suppressed pole- sized trees. These forests consist mainly of small and medium size classes of shade- tolerant and fire–sensitive species. Stands have also become less complex and more homogeneous in terms of spatial arrangement. In many areas, ecosystem diversity and sustainability appear to be jeopardized by these changes, even without the threat of fire. In the lower elevations, the park borders an urban interface that is being developed on almost a daily basis. This urban encroachment is occurring within an assemblage of chaparral, knobcone pine, and oak woodlands and is characterized by a fire regime that consists of intense and fast moving fires. When hot and dry summers, steep slopes, and frequent fire starts are taken into account, wildfire is inevitable. The synergistic effects of a naturally diverse region, history of anthropomorphic disturbance, and increasing pressures to promote fire- safe communities near federal lands, provides a challenging opportunity for researchers and land managers.

The means by which we need to restore and sustain these ecosystems are controversial. Letting nature take its course may be appropriate in some areas that are relatively unaffected by human activities, have relatively intact disturbance regimes, and do not juxtapose urban developments. However, this approach cannot be carried over to forests that have been recklessly logged and deprived of fire for what is estimated to be over one hundred years. Given the excessive quantity of fuels in the park's high elevation forests, continued fire suppression will be required, but suppression alone will only exacerbate the growing problems of overly dense stands and excessive fuels.

The historic structure and composition of Whiskeytown was created by a variety of disturbance regimes, and many of the tools available for mimicking these processes, lie within the disciplines of fire management. Given the narrow windows available in which fire management is able to execute prescribed burns, it is inconceivable that fire in its presettlement frequencies and severities could be restored fully. And, prescribed fire alone cannot fully mimic the ecosystem functions of presettlement fire because the forests have changed greatly and the effects of reintroduced fire are likely to be quite different than those of presettlement fire. If fire alone is used, several applications of prescribed fire will be necessary, especially in densely stocked high

elevation forests with heavy fuels concentrations, before the desired forest conditions can be approached. These early reintroductions of prescribed fire are expensive and have a high risk of escapes as well as undesirable effects. Because of this, land managers and forest scientists advocate the widespread use of fire surrogate treatments not only to reduce fuel loads and tree stocking levels to decrease the probability of large intense fires, but also to pre- treat prescribed burn units so that prescribed fire can be safely reintroduced into these dense forests.

The logistics of conducting enough prescribed burns in the park in order to produce the desired fire impacts is challenging due to heavy fuel loads, narrow burn windows, as well as the proximity of towns and 67 acres of private landholdings in the park. Other obstacles include air quality regulations, administrative moratoriums, and local sociopolitical constraints. Prescribed burn units need to be re- treated because total downed woody fuel loads five years post- burn can equal and sometimes significantly exceed the pre- treatment levels. An initial low intensity fire can result in moderate levels of mortality, particularly among smaller, suppressed trees in some decadent habitats within the park (National Park Service- Whiskeytown 2001). These trees typically fall to the ground within a few years and raise the 1000- hour fuel loads (downed woody materials larger than 3 inches in diameter) well beyond pre- burn levels.

Impact Topics

Whiskeytown National Recreation Area contains resources of geological, biological, cultural, and social value. The park was created both to provide for recreational opportunities and to conserve the natural environment. As a unit of the National Park System, the park is mandated to protect and conserve natural and cultural resources. The mandate is derived from the National Park Service Organic Act of 1916, which outlines the fundamental purposes of the National Park System. The mandate also directs the National Park Service to allow for public use and enjoyment of national parks, provided that the resources therein remain unimpaired for future generations. The conservation of resources takes primacy over the provision of recreation, however.

Biological environment

Plant communities

The park is located within the Klamath Mountain physiographic province and is an area of significant diversity due to proximity to the Cascade Range, Coast Range, and Sacramento Valley. The diverse plant communities intergrade with one another in such a way that distinct boundaries are seldom observed. This patchy vegetation pattern reflects a broad range in elevation, rugged topography, diverse soil types, and a history of natural and human disturbance. For the purposes of the Fire Management Plan and draft Environmental Impact Statement, these diverse habitats have been grouped into seven plant communities based on descriptions by Biek (1988) and Sawyer and Keeler- Wolf (1995). The seven plant communities are listed below.

- Mixed Conifer
- Ponderosa Pine
- Knobcone Pine
- Mixed Oak Woodland
- Blue Oak Grasslands
- Chaparral Communities
- Riparian Communities

The following sections describe the plant communities, their distribution, typical plant species, and responses to fire:

Mixed Conifer

The mixed conifer community covers approximately 10,000 acres and is primarily comprised of a mixture of co- dominant tree species. These species are ponderosa pine (*Pinus ponderosa*), incense cedar (*Calocedrus decurrens*), Douglas fir (*Pseudotsuga menziesii*), sugar pine (*Pinus lambertiana*), and white fir (*Abies concolor*). Sub- communities contain species that are less dominant but regionally plentiful such as white alder (*Alnus rhombifolia*), California yew (T*axus brevifolia*), red fir (*Abies magnifica var. shastensis*) and Jeffrey pine (*Pinus jeffreyi*). In areas of dense forest canopy, the understory shrubs are either sparse or scattered and consist of tan oak (*Lithocarpus densisflorus vars. densiflorus and echinoides*), greenleaf manzanita (*Arctostaphylos patula*), dogwood (*Cornus spp.*), western azalea (*Rhododendron occidentale*), snowbush (*Ceanothus cordulatus*), and sierra gooseberry (*Ribes roezlii*). Logging, debris flows, high severity fire and the nature of the granitic soils can create more open canopies so that montane chaparral species such as greenleaf manzanita, chinquapin (*Chrysolepis sempervirens*), tan oak and huckleberry oak (*Quercus vaccinifolia*) can dominate.

The groundcover in the mixed conifer plant community is composed of grasses, ferns, sedges, and some of the park's most unique herbaceous species such as parsley fern (*Cryptogramma acrostichoides*), twinflower (*Linnea borealis var. longifloria*), and bride's bonnet (*Clintonia uniflora*). The forest floor vegetation layer consists of low- growing lichens and mosses.

The mixed conifer forests can be found between approximately 3,000 feet to 5,900 foot elevation on Shasta Bally. A prime example of the mixed conifer community is found along Crystal Creek Road, from above the Crystal Creek Regional Boys Camp to Coggins Park. The unlogged areas at Coggins Park demonstrate a forest community that probably covered most of the higher elevation mountain slopes before they were logged. Jeffrey pine and white fir are found on the upper slopes of Shasta Bally, with the eastside favoring Jeffrey pine. A few acres at the summit of Shasta Bally have a significant amount of red fir.

Fire is an important ecological process in the development of mixed conifer forest types. While site- specific records for the park are limited, it is generally well recognized that frequent, low intensity fires historically characterized similar ecosystems in the western United States. These fires occurred across the landscape on an 8- 12 year interval (Literature citation.). Small- scale, high intensity fires did occur in isolated patches with some regularity, but historically were extremely rare. The frequent, low- intensity fires maintained moderate to low quantities of dead and down woody fuels, and favored the development of herbaceous understory species such as iris (*Iris spp.*), locoweed (*Astragulus gambelianus*), milkmaids (*Cardamine californica*), and bedstraw (*Galium spp.*), rattlesnake plantain (*Goodyera oblongiflora*), and several other orchids (*Piperia spp*). Other herbaceous species include exotics such as prickly lettuce (*Lactuca serriola*) and cat's ear (*Hypochaeris spp.*), and grasses such as nitgrass (*Gastridium ventricosum*), foxtails (*Bromus spp.*), silver hair grass (*Aira caryophyllea*), various fescues (*Vulpia spp.*), and dogtail grass.

In general, mature ponderosa pine is resistant to low and moderate intensity fires, while most other overstory conifer species are able to survive low intensity fires. Young saplings and seedlings are usually killed by fire, so relatively few small trees become large trees. The historic role of fire in the mixed conifer plant community was complex, varying over time and across the landscape. Under a natural fire regime, these factors promoted mosaics of even and uneven aged stands and structural diversity. The isolated high intensity patch burns provided for a mosaic forest where a mix of shrub and tree species predominated.

The role of fire in the development and maintenance of the mixed conifer forest has changed as aggressive fire suppression curtails slow moving ground fires. Populations of shade tolerant fir and incense cedar are not being controlled by fire, and there are few distinct breaks in the continuity of the understory vegetation. The incidence and subsequent influence of fire has been minimal over the last century. The result of this alteration in the historic fire regime combined with logging and mining is difficult to assess accurately, but some generalizations can be made based upon the limited available research.

Ponderosa Pine

Ponderosa pine forests cover approximately 10,000 acres in the park from approximately 1,500 to 3,000- foot elevations. Ponderosa pine is the dominant tree in this community with Douglas fir, dogwood, canyon live oak, and other scattered hard and softwood species present to a lesser extent. Black oak is co- dominant with ponderosa pine in many areas. The understory shrub component includes manzanita, ceanothus species, poison oak (*Toxicodendron diversilobum*) and toyon (*Heteromeles arbutifolia*). Other shrubs, herbaceous species and grasses are quite similar to those in the mixed conifer discussion above, with the exception that the lower elevation ponderosa pine communities have more annual and exotic grass cover, which may contribute to increased fire frequency.

The ponderosa pine forests in the park are often intermingled with mixed oak woodlands. Representative examples of this plant community can be seen on the slopes above Brandy Creek, along the Mill Creek Trail, along the Crystal Creek Water Ditch Trail, and on Monarch Mountain.

North- facing slopes in the Whiskeytown area are primarily composed of ponderosa pine- mixed conifer forests, with some black oak woodland. In the west, these forests have a well- known, almost famous intrinsic relationship with fire with frequent lower elevation understory fires in the pre- settlement ponderosa pine type (Brown et al 1994). Pacific ponderosa pines have numerous adaptations to fire, including a thick bark and open crown structure that allows this species to survive fires. This species also has a self- pruning mechanism that reduces the chance of crown fires. Other adaptations include deep roots, a high foliar moisture content, insulated bud scales, medium to light lichen growth, and seedlings that grow optimally in soil seedbeds that are cured by fire.

Research has shown that before suppression, most ponderosa pine stands experienced low intensity surface fires with a fire frequency ranging from 6- 19 years in different parts of its range. Research conducted by Skinner (in prep.) found that the median fire return intervals for the ponderosa pine- mixed conifer forests in the nearby Klamath Mountains were 7- 15 years with a range of 3- 55 years. Johnson (1980) conducted a fire scar analysis of Shasta Bally ponderosa pines and found that before 1900, natural fires occurred on an average of 13.5 years. Johnson also calculated the average frequencies according to aspect and found that fires occurred on south facing slopes an average of 12.9 years, southeast facing slopes 13.3 years, and northeast facing slopes 16.2 years. A fire regime for the ponderosa pine- mixed conifer communities of 7- 15 years is entirely plausible when fire scar data from the park is compared with other fire history research. Ponderosa pine communities exhibit slightly longer fire season than the higher elevation mixed conifer communities. The drier, lower elevation ponderosa pine forest supports a higher percentage cover of exotic annual grasses. These annual grasses are adapted to frequent fires and can develop a fine fuel layer sufficient to carry fire in a much shorter cycle than in the higher elevation mixed conifer forest.

Knobcone Pine

Knobcone pine communities cover approximately 2000 acres in the lower elevations of the park, from about 1000 to 2000 foot elevations. Stands of knobcone pine are typically even- aged, and range from dense stands with few other associate tree species to open communities co-dominated by black oak, with scattered grey pine (*Pinus sabiniana*), ponderosa pine, and other occasional hardwood and softwood species. The understory is variable, but typically dominated by white leaf manzanita (*Arctostaphylos viscida*), with toyon, poison oak, coffeeberry (*Rhamnus spp.*), yerba santa, and ceanothus species. In many stands a significant portion of the standing brush is dead. The groundcover when present can be quite diverse, consisting of a blend of perennial and annual grasses, with herbaceous species such as buckwheat (*Eriogonum spp.*), bracken fern, (*Pteridium aquilinum var. pubescens*) and everlasting (*Antennaria spp. and Gnaphalium spp.*) in more open areas.

The knobcone pine community often intergrades with the ponderosa pine, mixed oak woodland, and chaparral plant communities. Knobcone pine communities can be seen along the Mt. Shasta Mine Loop Trail, Whiskey Creek area, and along Mule Town Road towards the town of Shasta. Knobcone pines are not restricted to serpentine at Whiskeytown as they are in much of their natural range.

Knobcone pines are a serotinous species; most cones remain closed until opened by the heat from fire. While this closed- cone characteristic is more pronounced in this species than the other closed- cone pines and cypress (Vogl et al. 1977), the species does succeed in the absence of fire and is common on disturbed sites. The structure and species composition of this plant community is indicative of moderate to high frequency stand- replacing fires that results in the domination of fire- dependent species. A continuous fuel layer from the surface to tree crowns frequently exists in the knobcone pine community. This continuos fuel profile promotes a high severity crown fire system under typical fire season conditions. Knobcone pines are susceptible to moderate to high intensity fire due to their thin bark. Continued production and accumulation of cones throughout its lifetime ensures that large quantities of seed are released following such fires. A long- term benefit of this type of fire is the retrogressive role it plays in soil genesis. This process limits establishment of many plant species that would otherwise compete with the knobcone pines. Little information is available about low severity fire effects on this species.

Some areas representative of this type have extremely high densities of live and dead standing trees. Limited survey data from the park show areas of knobcone pine forest with live tree densities exceeding 400 trees per acre, and some stands with over 700 standing dead tree stems per acre. Such heavy accumulations of vegetation make the application of prescribed fire unsafe without significant pre- fire mechanical treatments. In some fire monitoring plots, five years following prescribed fire the total downed woody fuel loads are now higher than pre- burn data (Whiskeytown NRA Fire Effects Data, 2001).

Mixed Oak Woodlands

Mixed oak woodland communities cover approximately 10,000 acres scattered throughout the park at elevations up to 2,500 feet, although black oak woodland sub- communities can occur at much higher elevations. The lower elevation oak communities are dominated by black oak, canyon live oak (*Quercus chrysolepis*), and interior live oak (*Quercus wizlisenii*). Small communities of valley oak (*Quercus lobata*) are found near Clear Creek. Higher elevation communities are dominated by black oak and/or canyon live oak with scattered ponderosa pine and other hardwood and conifer species. Redbud (*Cercis occidentalis*) is found in open areas, and shrub understory species include manzanita, toyon, poison oak, wild rose (*Rosa spp.*), and several ceanothus species. Common herbaceous species include wild dandelion (*Agoseris spp.*), Indian paintbrush (*Castilleja spp.*) Indian warrior (*Pedicularis densiflora*), penstemon (*Penstemon spp.*),

California Indian Pink (*Silene californica*), iris, monkeyflowers (*Mimulus spp.*), California poppy (*Eschscholzia californica*), milkweeds (*Asclepias spp.*), columbine (*Aquilegia formosa*), woolly sunflower (*Eriophyllum lanatum*), lupine (*Lupinus spp.*) mule ears (*Wyethia spp.*), brodiaea (*Brodiaea spp.*), and yarrow (*Achillea millefolium*). Representative examples of mixed oak woodlands can be seen in the Brandy Creek area, Dry Creek area, and along Muletown Road.

The natural fire regime in mixed oak plant communities varies considerably depending on the species composition and vegetation structure specific to each site (this is true of all plant communities). Black oak is capable of abundant crown sprouting following fire, as light surface fires trigger succession through sprouting (Chang 1996). The frequency and vigor of resprouts is lower with increasing fire severity. Oaks are highly variable in their response and resistance to fire because of differences in their bark thickness, tree structure, and sprouting response. Understory composition and the degree of fire intensity (Husari and Hawk 1994) also influence individual survival.

One factor causing fire damage to oaks is due to the fact that most associated species are susceptible to fire damage. Canyon live oak and interior live oak have fairly thin bark and are easily top- killed by fire. However, light surface fires trigger succession in live oak species through sprouting (Chang 1996). Increased fire severity results in increased overstory tree mortality, particularly among interspersed pine species. Vigorous resprouting from black oak root crowns was observed three weeks after the extremely hot "Whiskey" wildland fire in August 1999 (Gibson, personal observation). Other adaptations of black oak include the need for bare or almost bare soil required for acorn germination; a soil condition that results from light or moderate severity fires. Frequent low- severity fires promote a park- like appearance in mixed oak woodlands similar to the mixed conifer forest, although the mixed oak woodlands can have higher structural diversity and a less distinct gap between ground fuels and overstory tree canopy than is seen in mixed conifer forests.

Blue Oak Grasslands

Blue oak grasslands cover approximately 400 acres within the park. Unlike the other plant communities, the blue oak grasslands appear to have distinct boundaries that are a result of soil properties and past land use practices. The dominant species is blue oak (*Quercus douglasii*) that is associated with scattered gray pine and interior live oak. Shrubs are widely spaced and include manzanita, yerba santa, ceanothus, and poison oak. The groundcover includes annual and perennial grasses such as ripgut brome, dogtail grass, star thistle (*Centaurea sp.*), fescues, wild oat (*Avena fatua*), and nut sedge (*Cyperus strigosis*).

The blue oak grassland community can be seen in distinct patches on the south- facing slopes along Highway 299 near Crystal Creek Road. Other areas include clearly defined zones between the low elevation (1,100- 2,000 feet) mixed woodland and knobcone pine plant communities along Muletown Road, toward the community of Igo.

Blue oak communities are generally thought to benefit from fire (isn't fire beneficial to all communities?). Acorn survival and germination may be negatively affected by fire but there is a positive association between blue oak ages and fire dates, suggesting postfire sprouting. The low rate of recruitment since the 1940's may be partly due to fire suppression (McClaran and Bartolome 1989). The sensitivity of blue oaks to high intensity fires is not well understood; low intensity fires have little effect on the overstory tree canopy in the blue oak woodland, although aboveground portions of shrubs other low growing plant species can be largely consumed. Moderate intensity fires result in varied levels of crown scorch. Frequently, large trees or stems of trees would be consumed in this type of fire, but sprouting subsequent to such fires is often

quite high. The result is rapid recovery of the overstory or development of small pockets of young trees.

Infrequent fire regimes favor development of woody shrub species, while frequent fire intervals favor greater cover by grasses and forbs. Changes in the understory vegetation, primarily in the prevalence of annual exotic grass species may have an influence on the behavior of the current fire regime, but sufficient data does not exist to make this determination. It is suspected that fire exclusion for an extended period of time enables shrub species and associated tree species such as gray pine to gain in total cover, but data has not been collected to confirm this in the park.

Chaparral

Chaparral plant communities cover approximately 8000 acres in the park. The chaparral plant community varies in species composition and vegetation structure from distinct monocultures to combinations of shrub and small tree species that intergrade with other plant communities. Thick, leathery, oily leaves that form a highly flammable leaf litter layer characterize chaparral species. Such characteristics enable chaparral plants to withstand extremes in temperature and precipitation, as well as the periodic consumption of fire. This broad- leaved community is diverse, ranging from dense, impenetrable thickets to open, mixed shrub- oak woodlands. While chaparral over most of its range is characterized by stand- replacing fire, this may not apply to some of the chaparral in the park, as fire severity and fire effects in prescribed burns have been mixed.

Chaparral communities in the park are dominated by white leaf and greenleaf manzanita, ceanothus species, chamise (*Adenostoma fasciculatum*), toyon, yerba santa (*Eriodictyon californicum*), and poison oak. Oak and pine species are also sparsely scattered throughout many of the drier areas, and occur with some density on wetter sites and north and northeast facing slopes. The thick layer of leaf litter and lack of light results in a sparse herbaceous understory of species such as brodiaeas (*Brodiaea spp*.), wild onion (*Allium spp*.), chaparral honeysuckle (*Lonicera interrupta*), creeping sage (*Salvia sonomensis*), and Indian warrior (*Pedicularis densiflora*). Common exotic grasses include rye (*Lolium perenne*), cheatgrasss, and fescues (*Vulpia spp*.).

A montane chaparral plant community occupies the loose, sandy, granitic soils between the 3000-foot elevation and the top of Shasta Bally. This montane chaparral is dominated by greenleaf manzanita, combined with pinemat manzanita (*Arctostaphylos nevadensis*), common manzanita (*A. manzanita*), mountain whitethorn (*Ceanothus cordulatus*), huckleberry oak, and bush chinquapin. Understory species in this community are usually absent, and this community appears to be the result of past crown fire in forest vegetation, as well as logging of mixed conifer forests at high elevations on highly erodible soils.

Typical low elevation chaparral communities are found on south- facing slopes north of Whiskeytown Lake and Highway 299, and are scattered throughout the park on dry sites at lower elevations. Chamise- dominated chaparral has a more limited distribution; typical populations can be found in the Whiskey Creek area and bordering the blue oak grasslands north of Highway 299 near Crystal Creek Road. Montane chaparral can be seen at the summit of Shasta Bally and on logged slopes surrounding the old- growth forest at Coggins Park.

Although fire- return intervals in chaparral vary among different sites (Skinner and Chang 1996), most shrublands are believed to be adapted to and seem to persist where there are relatively infrequent but recurring fires (Skinner 1995). Fires are characteristically intense, with soil surface temperatures reaching 650 degrees Fahrenheit, removing all or most of the aboveground biomass (Kricher 1998). The natural fire regime perpetuates a mosaic of age classes within the chaparral

community, decreasing the chance for widespread wildland fires. Chaparral is highly flammable and also possesses various adaptations to fire, including the ability to sprout massively and quickly from thickened root bases after even severe burning or produce a heavy crop of seedlings from fire- resistant and fire- stimulated seeds that germinate following fire (Chang 1996, Keeley 2000). Chaparral typically exhibits a highly specialized post- fire flora. The short- lived species may grow mostly, or only after fire, and exist as dormant seed between fires. Vegetative responses vary and are determined by a complex interaction of temperature, soil moisture, heat duration, depth of burn, and season of burn (Weatherspoon 1988). Bulb plants that may be more or less dormant between fires typically grow vigorously after fire, and may exhibit fire-dependent, or fire enhanced reproduction (Tyler in press). Seeds of ceanothus species germinate vigorously following fire (Hastings and DiTomaso 1996).

In some areas of the chaparral plant community, species composition following fire closely resembles what was there before the fire, which suggests that chaparral is the climax community. Such communities recover quickly from fire and regain dominance soon after (Biswell 1974). In other areas, however, the absence of fire or occurrence of low severity fire allows the slow development of an overstory tree canopy that can eventually dominate a site. This process is highly pronounced in the montane chaparral community, where shrub species face competition with tree species. Therefore it takes high severity fire effects to remove the tree species and allow the establishment of chaparral. After initial establishment, periodic moderate to high severity fires help maintain the chaparral by killing trees before they shade out the shrubs, whereas alternative fire regimes allow the trees to regain dominance.

Historically, the intense, fast- moving fires characteristic of chaparral were confined by natural fuel breaks formed by age- class boundaries and topographic features. Research by Minnich (1995 and earlier papers cited therein) in Baja California suggested that fire maintained a relatively fine scale age class mosaic there. Recent research (Keeley et al. 1999, Moritz in press) has found that north of Baja California, fires would tend to burn through chaparral of any age class older than about 5 years, i.e. that fire spread is largely determined by weather.

Successful seedling establishment of many plant species in chaparral plant communities does not occur in the absence of fire. Fire return intervals in chaparral appear to be quite variable, depending upon local site conditions, proximity to areas of aboriginal human use, and elevation. Chaparral fire return intervals generally have been estimated to be 20- 50 years with ranges of approximately 10- 100 or more years (Keeley 1982, Kilgore 1987, Barro and Coparkd 1991). Studies about chaparral fire intervals in California are generally confined to studies on the Coast and Transverse ranges, and may represent conservative estimates of fire frequency for inland areas like Whiskeytown due to the differences in lightning frequency and burning conditions (Keeley 1982).

Riparian Vegetation

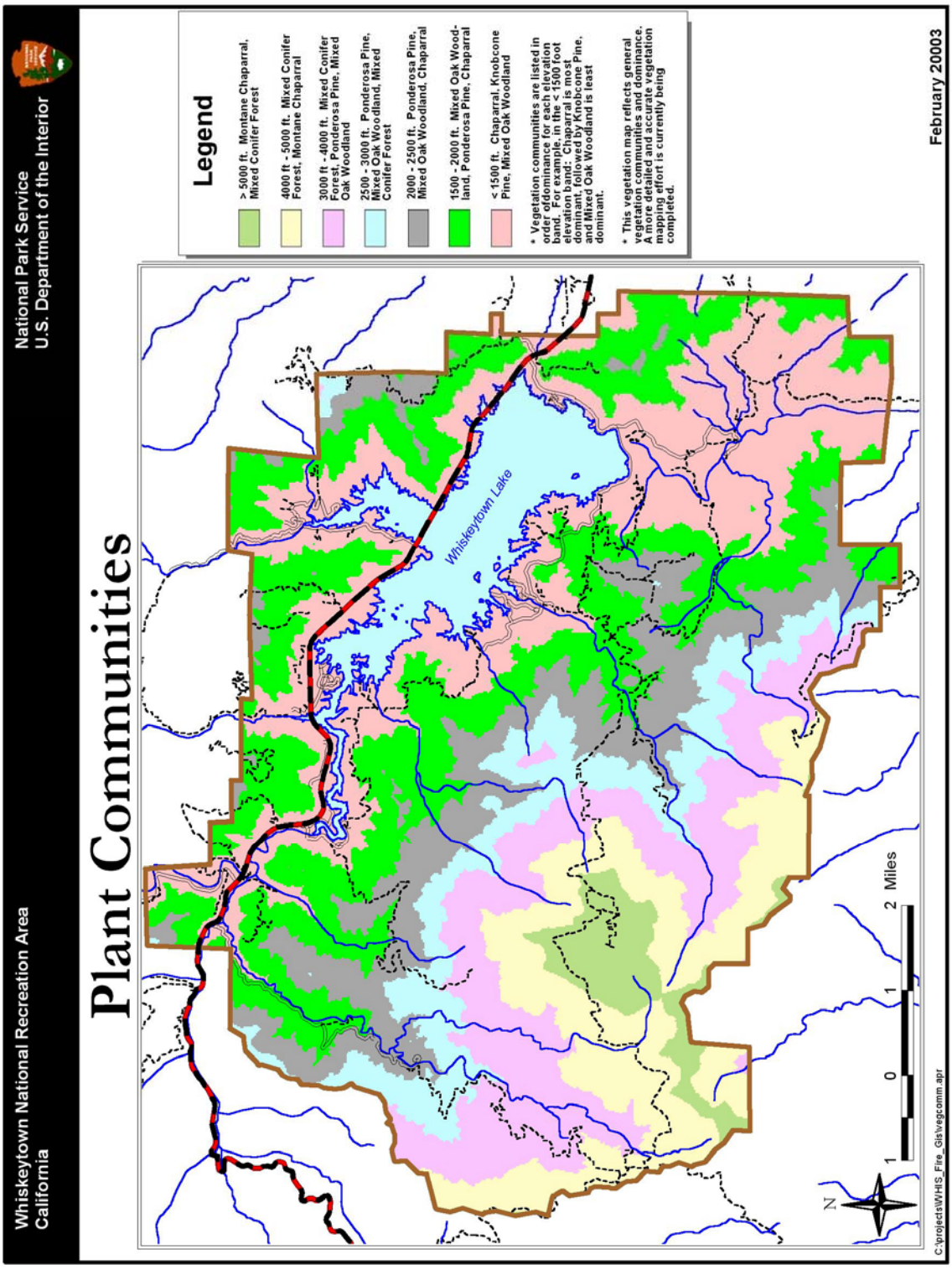
Whiskeytown lies at the confluence of seven perennial tributaries that form one of the largest watersheds flowing into the Sacramento River. Riparian communities cover approximately 4,000 acres and vary in species composition and vegetation structure depending on elevation, steepness of slope, aspect, and quantities and timing of the water source. Although vigorous and well vegetated, little data is available on the vegetation of the riparian communities. Tree species occurring on canyon slopes and seasonal ravines primarily consist of Douglas fir, canyon live oak, dogwood, bigleaf maple (*Acer macrophyllum*), and scattered mixed conifers. On canyon bottoms, the lake edge, and moister sites tree species include Fremont's cottonwood (*Populus fremontii*), black cottonwood (*Populus balsamifera ssp. trichocarpa*), willow (*Salix spp.*.), White alder (*Alnus sp.*), and Oregon ash (*Fraxinus latifolia*).

Understory species are quite variable. Native shrub species include California blackberry (*Rubus ursinus*), wild grape (*Vitus californica*), western azalea (*Azalea spp.*), miner's dogwood (*Cornus sessilis*), spice bush (*Calycanthus occidentalis*), button willow (*Cephalanthus occidentalis var. californica*), snowberry (*Symphoricarpos albus var. laevigatus*), and California wild rose (*Rosa spp.*), with chaparral species such as buckeye and snowdrop bush (*Styrax officinalis*) mixed in along the periphery. The understory is a combination of Indian rhubarb (*Darmera peltata*), grasses such as slender hair grass (*Deschampsia elongata*) and rattlesnake grass (*Briza spp.*), Horsetails (*Equisitum spp.*), sedges, rushes, ferns, cattails (*Typha spp.*), and herbaceous species such as soaproot (Chlorogalum pomeridianum), California pipevine (*Artistolchia californica*), buttercups, (*Ranunculus spp.*), phacelia (*Phacelia spp.*), monkeyflower, smartweed (*Polygonum spp.*), mugwort (*Artemesia douglasiana*), miner's lettuce (*Claytonia perfoliata and Montia parviflora*), self- heal (*Prunella vulgaris*), dock (*Rumex spp.*), and violets (*Viola spp.*).

The exotic Himalayan blackberry chokes a significant portion of the riparian community. Other common exotic species include black locust (*Robinia pseudoacacia*), cut- leaf blackberry, plantains (*Plantago spp.*), and mulleins (*Verbascum thaspus and V. blattaria*).

A willow- scrub riparian plant community can be seen along upper Clear Creek, lower Clear Creek near Peltier Bridge Campground, and Willow Creek. A white alder riparian forest lines streams in deep, steep- sided canyon bottoms above about 2,000 feet, along Boulder Creek, Crystal Creek, and Brandy Creek. A unique yew- willow riparian woodland with California yew (*Taxus spp.*) and a variety of willows is found on Shasta Bally.

The role of fire in riparian areas is uncertain, as minimal data is available (Agee 1994). The assumption can probably be made that fire regularly affected most forest zone riparian areas prior to fire suppression, although moister conditions would offer some protection. Species- specific effects of fire on individual plants vary, although most riparian plants are not adapted to high intensity fire. Some species, such as pacific yew, are quite sensitive to temperatures generated in even low- intensity fire. Although prescribed burning reduces the probability of high severity wildland fires, precautions must be exercised to maintain biodiversity by protecting temperature-sensitive species, such as Pacific yew. Willow species appear to sprout vigorously and grow rapidly following fire or other disturbances. Skinner (1997) found that in areas with intermittent streams in the upper Klamath Mountains, fires appear to have burned with a frequency similar to the surrounding uplands. Skinner's work found a range of fire return intervals within these riparian areas to be 6- 47 years, with a median fire return interval of 13 years.



Map of Vegetation Community Association Zones by Elevation, Whiskeytown National Recreation Area

Special Status Plant Species
National Park Service management policies and the USFWS Endangered Species Act mandate protection of special status plants and their habitats. The National Park Service is also responsible for providing information to the Endangered Species Office on the status of candidate or proposed candidate plants within their jurisdiction. The implementation of inventory and monitoring protocols is required to collect this information.

An extensive floristic inventory of the park and collection of herbarium voucher specimens was initiated in 1986 by David Biek, and completed with the assistance of the Shasta Chapter of the California Native Plant Society. Sixteen sensitive plants are known to occur in the park. Sensitive plant species are plants that are not officially listed as threatened or endangered by the State of California or the federal Endangered Species Act, but warrant consideration and protection due to limited distribution, scarcity of individuals, or the likelihood of becoming listed as threatened or endangered. These sixteen plants and their current status are detailed in the California Native Plant Society publication "*Inventory or Rare and Endangered Plants of California, sixth edition*", 2001.

Table 3-1 Sensitive Plants in Whiskeytown National Recreation Area

Sanborn's onion	*Allium sanbornii*
Three-bract onion	*Allium tribracteatum*
Shasta County arnica	*Arnica venosa*
Clarkia	*Clarkia mildrediae* and *Clarkia virgata*
Clustered lady's slipper	*Cypripedium fasciculatum*
Small spikerush	*Eleocharis parvula*
Red-anthered juncus	*Juncus marginatus var. marginatus*
Rattan's linanthus	*Linanthus rattanii*
Tehama navarretia	*Navarretia heterandra*
Snowmountain beardtongue	Penstemon purpusii
Howell's alkali grass	*Puccinellia howellii*
Sanford's arrowhead	*Sagittaria sanfordii*
Canyon Creek stonecrop	*Sedum paradisum*
Western trillium	*Trillium ovatum*
Trinity Mountain triteleia	*Triteleia crocea var crocea*

There are no known state or federally listed threatened or endangered plants in the park, although blue elderberry is host to the federally listed threatened valley elderberry longhorn beetle, and the elderberry must be protected as if it were listed. Potential impacts from visitor use, developments, fire management actions, air pollution, road maintenance, and other disturbances are undocumented.

The current status of some of these plants in the park is unknown, and some historic populations have not been surveyed since the late 1980s. Survey and inventory work on these sensitive plants was initiated in 2000, and current inventory data can be found in Appendix A: Whiskeytown NRA Species List. Two species, Shasta County arnica and Howell's alkali grass have been monitored sporadically for several years. Sporadic monitoring is ongoing for both species, using protocols developed by the park.

Shasta County arnica is a plant limited in distribution known to occur only in a 35- mile radius area around Shasta Lake, Trinity Lake, and Whiskeytown Lake. Monitoring since 1992 indicates that populations are increasing or holding their own. The plant seems to prefer disturbed areas like road cuts and fuel breaks with a north or northeast aspect.

Howell's alkali grass, a rare grass whose only known global location is in Whiskeytown National Recreation Area, was recognized as a distinct species in 1989 and little is known about its biology and ecology. Some studies have been completed that are available at the park for review. The grass appears to be an obligate wetland species and the only known worldwide population is unevenly distributed within a complex of three mineral springs at an elevation of approximately 1,350 feet. Realignment of the highway in 1991 destroyed 1,200 square feet of plants and habitat, and may have altered the hydrology of the springs. The proximity of the grass to the highway means it is potentially subject to high severity events that could eliminate all or a major portion of the population, and/or its habitat. This species could be considered stable and sustainable only if additional populations are discovered in other protected locales.

Formal management and recovery plans for Howell's alkali grass have yet to be addressed. Measures to protect the grass would also protect the mineral springs, a rare community that is of considerable importance to wildlife and critical habitat for Howell's alkali grass. To preclude federal listing as threatened or endangered, the National Park Service and U.S. Fish and Wildlife Service, have, for a number of years, been attempting to develop a conservation agreement that would include the California Department of Transportation and the California Department of Fish and Game. The conservation agreement would outline protection measures to be implemented, the contributions of each agency, and provide for listing the species as Endangered if the conservation agreement fails to result in adequate protection.

Two additional species of concern within the park include blue elderberry (*Sambucus mexicana*) and McNab Cypress (*Cupressus macnabiana*). Although the tree is not listed as threatened, endangered, or sensitive by federal or state governments or the California Native Plant Society, the park considers McNab Cypress to be a species of concern due to its limited range and apparent decline in the park. Whiskeytown is the northernmost extension of McNab cypress, and the type location for the species. According to Biek (1988), a grove of McNab Cypress grew on metavolcanic rock along Clear Creek downstream from the historic town of Whiskeytown. This area is now beneath the waters of Whiskeytown Lake. A few specimens were transplanted to various locations in the park and to two residences in the towns of French Gulch and Redding. One specimen that appears to be naturally recruited is found near Clear Creek near the Tower House Historic District. Anecdotal information indicates that there were others scattered around the park. Three of these specimens remain; the others have been inadvertently removed by work crews, died from probable development impacts, or appear to be dying as a result of being limbed. Of the three remaining specimens, two are near failure from slumping, and are threatened by a restoration project. McNab Cypress is exceedingly difficult to propagate but several have been successfully grown from seed and are being planted in appropriate areas in the park. These appear to be doing well, and the park will continue to propagate and plant this uncommon tree.

Blue elderberry is a species of concern because it is the host plant for the federally listed threatened valley elderberry longhorn beetle. One elderberry shrub is known in the park, growing near Trinity Mountain Road along Clear Creek. The park is required to protect the elderberry in accordance with guidelines provided by the USFWS.

Invasive Plant Species

Numerous exotic or alien plant species have become established in some areas of the park, and exotics currently account for approximately 25- 30% of the plants in the park. Many exotic plants are highly invasive, able to out- compete native species, and disrupt native plant communities and processes. An accurate and complete assessment of the abundance and extent of exotics in the park initiated in 2002 will be complete in 2003. Several infestations have been successfully treated and control efforts for the next several years are expected to achieve a significant reduction in exotic plant populations in the park. Treated areas will require

monitoring and re- treating indefinitely. The park works cooperatively with the Shasta County Weed Management Area to eradicate exotics across boundaries.

Table 3-2 Target Exotic Invasive Plants in Whiskeytown National Recreation Area

Spanish Broom	*Spartium junceum*
Scotch broom	*Cytisus scoparius*
French broom	*Genista monspessulana*
tree of heaven	*Ailanthus altissima*
Himalayan blackberry	*Rubus discolor*
yellow star thistle	*Centaurea solstitialis*
giant reed	*Arundo donax*
common mullein	*Verbascum thaspus*
bull thistle	*Cirsium vulgare*

Mandates that require direct action to monitor and control the spread of exotics include the 1916 National Park Service Organic Act, the General Management Plan for the Whiskeytown Unit (2001), and agency- wide policy document National Park Service- 75 (1992). Changes in vegetation resources must be observed and documented in order to interpret and analyze such changes as the basis of informed decisions.

The goal of the exotic plant program is to reduce exotic pest plant populations in the park and allow re- colonization by native species. Developed areas along main roads are currently being treated, and backcountry sites will be treated secondarily, working from the least to the most infested areas, which has been shown to be the most effective method (Fuller and Barbe 1985). Strategies are outlined below.

- Inventory and map exotic plants in developed areas.
- Prioritize areas with regard to urgency and develop area plans.
- Develop education programs for visitors and employees.
- Control high priority exotic plant species.
- Monitor treated areas at least annually.
- Conduct regular and repeated maintenance to prevent re- infestation.

Relationships between fire and the spread of invasive exotic species have become increasingly clear over the past few years, but little data is available for the return of exotics following fire in the park. Bull thistle (*Cirsium vulgare*) has colonized the "Coggins IV" burn unit and the Salt Creek shaded fuel break with dozens of plants that were not previously noted in that location (personal observation, Gibson). Himalayan blackberry responds vigorously to fire of all severity classes, and is well adapted to invade recently burned areas (FEIS). Mustards and thistles are known to proliferate following fire, and exotics are thought to become dominant due to increased light and nutrient availability. Other exotics found in the park that respond favorably to burning include giant reed, perennial rye (*Lolium perenne*), cheatgrass (*Bromus tectorum*), medusahead (*Taeniatherum caput- medusa*), tamarisk (*Tamarix chinensis*), and the brooms. Brooms expand their distribution with a single fire, but may be controlled with repeated fire (Odion and Haubensak 1997).

Some invasive exotics build up a large seedbed in the soil, with viable seed lasting for many years until the next disturbance. Short fire- return intervals caused by increased flammability of the dense grasses can type- convert native communities, as native plants are unable to survive these frequent fires (Brooks 2001). The increase in fire frequency can be significant. Return intervals

increased from 60- 100 years to 3- 5 years in certain locations of the Great Basin following invasion by exotic grasses (Giessow and Zedler 1996).

Wildlife

The Whiskeytown Unit supports an abundant and diverse wildlife community, which reflects the diversity of the vegetative communities in the park. More than 200 vertebrate species are known to occur in the park, including at least 35 mammal species, 150 bird species, and 25 reptile and amphibian species (Appendix A). Additional species are likely to be confirmed in the park as wildlife inventories become more complete. The perpetuation of relatively intact wildlife populations within the park is partially dependent on the ability of public and private land managers to ensure that adequate habitat is protected in and around the park boundary. The population of Redding has grown from 16,000 to 80,000 in the last 20 years, and some encroachment on wildlife habitat near the park has occurred. Habitat fragmentation resulting from current and past land management actions within and outside of the park boundary continues to be a major threat to wildlife. High severity wildland fire from unnatural fuel buildup and the introduction of exotic species are other major threats.

Whiskeytown Lake and its tributaries support a large variety of fish, both native and exotic. Fish present at Whiskeytown include rainbow trout (*Salmo gairdnerii*), largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieui*), spotted bass (*Micropterus punctulatus*), Kokanee salmon (*Oncorhynchus nerka kennerlyi*), chinook salmon (*Onchorhynus tshawytscha*), bluegill (*Lepomis macrochirus*), black crappie (*Poxomis nigromaculatus*), brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis*), channel catfish (*Ictalurus punctatus*), brown bullheads (*Ictalurus nebulosus*), Sacramento squawfish (*Ptychocheilus grandis*), hardhead (*Mylopharodon conocephalus*), green sunfish (*Lepomis cyanellus*), western suckers (*Catostomus occidentalis*), and riffle sculpins (*Cottus gulosus*). The California Department of Fish and Game regularly stocks rainbow trout in Whiskeytown Lake and some of the perennial streams during the spring and summer months. The lake has also been historically stocked with brown trout and kokanee salmon.

Special Status Animal Species

Whiskeytown National Recreation Area also has responsibility to protect and perpetuate sensitive, unique, rare, threatened, or endangered fauna. Good data exists documenting most rare, threatened, or endangered animals. As watershed restoration efforts to increase the number of listed fish species up lower Clear Creek continue, there is the likelihood that all of these species would increase in numbers. The lack of good information on vegetation now makes the evaluation of habitat used by potential rare, threatened, or endangered animals difficult, and makes decisions about managing these species somewhat subjective. After a vegetation- mapping project currently underway is completed, the ability would exist to readily retrieve habitat population data that would facilitate analysis.

Two federally threatened wildlife species are known to occur in the park, the bald eagle (*Haliaeetus leucocephalus*) and the northern spotted owl (*Strix occidentalis caurina*). Bald eagles were first documented as nesting at Whiskeytown Lake in 1973. Whiskeytown currently hosts two nesting pair of bald eagles as well as a substantial wintering population.

The goals of bald eagle management at Whiskeytown are to protect nesting bald eagles from disturbance and to maintain and enhance bald eagle habitat. The following actions are taken to accomplish these goals:

- Eliminate disturbances to bald eagle nest sites between January 1st and July 31st of each year by restricting access to nesting territories via area closures.
- Consult with the U.S. Fish and Wildlife Service, under section 7 of the Endangered Species Act, prior to development or habitat manipulation within a bald eagle nesting area.
- Conduct low intensity prescribed fires that preserve dominant trees and reduce fuel loads to decrease the probability of high severity wildland fire.
- Periodically monitor bald eagle prey base, especially fish and waterfowl populations, to document changes that could affect eagle productivity.
- Develop silvicultural prescriptions, in conjunction with U.S. Fish and Wildlife Service, to manage for present and future suitable bald eagle nesting habitat.

Two nesting pairs of bald eagles were monitored for nesting success sporadically from 1979 to 1986. Bald eagles have been closely monitored for nesting success and productivity since 1986. Areas of the park that contain potential bald eagle nesting habitat are surveyed annually for potential new nesting territories. California Department of Fish and Game Bald Eagle Nesting Territory Report Forms are completed at the end of each nesting season. Additionally, the park participates in the annual U.S. Fish and Wildlife Service mid- winter bald eagle survey.

A single pair of nesting northern spotted owls with two fledglings was discovered in the summer of 1994. The activity center has been be monitored annually since this time and records are kept detailing nesting location, status, and production. This activity center has successfully produced young during three of the last seven years. Spotted owl surveys are ongoing and eventually all suitable habitat within the park would be surveyed. The detection of additional pairs of northern spotted owls is possible as some suitable habitat exists in some of the more remote areas of the park. The park consults with the U.S. Fish and Wildlife Service, under section 7 of the Endangered Species Act, prior to development or habitat manipulation in areas meeting the criteria for suitable spotted owl habitat.

The range of the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), a federally threatened species, overlaps the park and some suitable habitat may exist in the lower elevation riparian areas, but no sightings of either the beetle have been confirmed to date. Elderberry has been documented along a portion of Clear Creek above the reservoir.

The peregrine falcon (*Falco peregrinus*), a recently federally delisted species and state Endangered Species, has been reported a few times by members of the local chapter of the Audubon Society and is likely a migrant, although some potential nesting habitat may exist on the southeast side of Shasta Bally.

Two federally threatened fish species occur in Clear Creek below Whiskeytown Dam. These are the spring- run chinook salmon and Central Valley (Evolutionary Significant Unit) steelhead trout. The removal outside of the park of McCormick- Saeltzer Dam on lower Clear Creek in the fall of 2000 has allowed these two species access to Whiskeytown. These anadromous fish are now utilizing portions of lower Clear Creek within Whiskeytown for spawning. Spawning gravel is being added to Clear Creek below Whiskeytown Dam to enhance this habitat.

The park also contains six federal Species of Concern. Those species are foothill yellow- legged frog (*Rana boylei*), tailed frog (*Ascaphus truei*), northwestern pond turtle (*Clemmys marmorata marmorata*), pacific fisher (*Martes pennanti pacifica*), and the pacific western big- eared bat

(*Corynorhinus townsendii townsendii*). Whiskeytown contains several species with California State status but no federal status. The bank swallow (*Riparia riparia*), a California threatened species, has been observed several times within the park by members of the local Audubon Society and is probably a rare summer resident. The following species are confirmed to occur at Whiskeytown and are California Species of Special Concern: Cooper's hawk (*Accipiter cooperii*), sharp- shinned hawk (*Accipiter striatus*), osprey (*Pandion haliaetus*), yellow- breasted chat (*Icteria virens*), yellow warbler (*Dendroica petechia*), common loon (*Gavia immer*), California gull (*Larus californicus*), double- crested cormorant (*Phalacrocorax auritus*), pallid bat (*Atrozous pallidus*), and merlin (*Falco columbarius*). As wildlife inventories become more complete additional species with federal or state status may be discovered within the park.

Ecologically critical areas

For the purposes of this document, the following four areas within the park are considered to be ecologically sensitive as they embody unique and special resource values as described below.

Mineral springs

One of the most unique and ecologically sensitive areas within the park is a complex of three noncontiguous mineral springs that occur between a 1,200- foot segment of Willow Creek and Highway 299. Despite extensive surveys, this is the only known global location Howell's alkali grass, an obligate wetland grass species that appears to have specific microhabitat requirements to the alkali water that seeps from the skeletonized soils and rock outcrops. Aside from being critical habitat for Howell's alkali grass, this site is recognized to be a community of considerable importance to wildlife, and species of concern, such as Pacific fishers, band- tailed pigeons, and foothill yellow- legged frogs are documented to use the site. The mineral springs are also a culturally significant area listed by the State of California as a Significant Natural Area (SHA- 41).

Old growth

The sections of unlogged old- growth forest in the park constitute ecologically sensitive areas with unique aesthetic and natural resource values. These old growth forests represent those that covered the mountain slopes prior to logging, and provide an intact and relatively undisturbed habitat for flora and fauna that are threatened throughout the Klamath Mountains. The old growth sections may be a close representation of desired future conditions in mixed- conifer and ponderosa pine forests in the park.

Perhaps the greatest threat to the old- growth forests is the unnatural accumulation of ladder fuels due to fire suppression. Significant soil disturbance is another concern, due to the steep topography and highly erodible soils. Some old- growth areas qualify as critical habitat for goshawks, numerous amphibians, and the federally threatened spotted owl. Some sensitive plant species such as yellow tritieleia, and Salmon Mountains wakerobin grow in the mature, moist conditions, as do phantom orchid, spotted coral root, rattlesnake plantain, tiger lily, white- flower bog orchid (*Piperia unalescensis)*, and broadleaf twayblade.

Top of Shasta Bally

One small section at the summit of Shasta Bally presents the only example of the sub alpine meadow community found in the park. The area is located on the eastside of the summit in a shallow bowl, surrounded by red fir, where deep snow accumulates in the winter. This area is ecologically sensitive and highly susceptible to disturbance. The melting snow provides water to the fine, porous, decomposed granite soil. Grasses, sedges, rushes, and small herbs cover the ground and a small patch of false hellebore (*Veratrum californicum var. califonicum*) also grows here, in the wettest spot. This species is characteristic of the Wet Sub alpine Meadow community

that is common the Klamath Mountains but rare within the park. Other plants found here include the sensitive species snow mountain beardtongue, three- bract onion, clustered lady's slipper, yellow triteleia, and bog orchid).

Riparian habitats
Riparian plant communities provide wildlife corridors and habitat for aquatic species of plants, animals, and invertebrates. Biodiversity, water quality and quantity and recreation values are provided, enhanced, and protected in riparian areas. Some species, such as pacific yew, are quite sensitive even to low- intensity fire, and precautions must be taken to protect yew and other temperature- sensitive species.

Geophysical Environment

Geologic Resources

The proposed Fire Management Plan alternatives all describe actions that potentially would occur on all geologic rock and structure types occurring within Whiskeytown. Physical, chemical, spatial, and temporal characteristics of Whiskeytown's rocks dictate the response of the rocks and associated soils to the actions proposed in each alternative. For example, older rocks tend to be more fractured and these physical and temporal properties can contribute to erosion. Chemical composition of rock can also inhibit or accelerate erosion. Weathering of bedrock is influenced by spatial properties such as relief, altitude, and aspect. All rock units within Whiskeytown are considered highly to extremely erosive when disturbed due to their chemical composition, fracture, and weathering environment.

Whiskeytown is located in the Eastern Klamath Metamorphic Belt of the Klamath Geologic Province. The five major exposed bedrock units range in age from the very old lower Devonian Copley greenstone to the relatively less old lower Cretaceous Shasta Bally batholith. Also present within Whiskeytown are several dike intrusions ranging in composition from aplite to dacite. Unconsolidated Quaternary units expressed as colluvial and alluvial deposits locally overlie all units. All Paleozoic units are folded, jointed, and thrust faulted and/or normal faulted.

Table 3-3 Exposed Bedrock Units in Whiskeytown National Recreation Area

Feature	Age	Type
Shasta Bally batholith	Cretaceous (Mesozoic)	Granodiorite to Quartz diorite
Mule Mountain stock	Jurassic (Mesozoic)	Metaplagiogranites
Bragdon formation	Mississippian (Paleozoic)	Sedimentary
Balakala rhyolite	Devonian (Paleozoic)	Metavolcanics
Copley greenstone	Devonian (Paleozoic)	Metavolcanics

The oldest exposed bedrock units are the volcanic lower Devonian Copley greenstone and the Balakala rhyolite, which cover about 30 % of the geology within Whiskeytown. The units are considered contemporaneous in age and emplacement with an often inter- fingering contact relation. Copley greenstone is considered to be of near- shore oceanic origin to on- shore (Albers 1964) and composed of keratophyre, spilite, meta- andesite, tuff, shaly tuff, and shale. Subsequent hydrothermal alteration of mafics to chlorite provides the pervasive green color. The Balakala rhyolite is considered to be of on- shore to near- shore origin and is composed of porphyritic quartz keratophyre, tuff, and tuffaceous shale. The Balakala rhyolite is albitized from the same hydrothermal processes that altered the Copley greenstone. Medium- temperature, medium- pressure contact metamorphism from intrusion of the Shasta Bally batholith has

alteration zones of granulite and amphibolite facies present within these units. Both of these units are highly fractured, faulted, and folded, increasing their susceptibility to erosion.

Stratigraphically above and in unconformable contact with the Balakala rhyolite and Copley greenstone is the Bragdon formation of Mississippian age. This contact is locally referred to as the Spring Creek thrust. The Bragdon formation is composed of three units variously composed of conglomerate, sandstone, siltstone, shale mudstone, and tuff. A fourth unit is composed of phyllite derived from contact metamorphism of the Shasta Bally batholith. This formation is highly fractured, faulted, and folded, increasing their susceptibility to erosion.

The Jurassic Mule Mountain stock covers about 20% of the geology within Whiskeytown and is stratigraphically above and in unconformable contact with the Bragdon formation. This plagiogranite ranges in composition from albite granite to trondhjemitic granite. The Mule Mountain stock is very unstable due to the highly fractured, faulted, and folded history and post-emplacement albitazation.

The youngest non- Quaternary rock is the Cretaceous Shasta Bally batholith and associated dike intrusions and covers about 35% of The park geology. The Shasta Bally batholith as has three facies that range from quartz diorite to granodiorite and are differentiated by the ratio of hornblende and biotite and by crystalline size. Biotite is an expansive mica mineral that readily decomposes with water and is the primary cause of extreme erosion. A large zone (70% within the park) of the batholith has a very high ratio of biotite to hornblende and is extremely erosive. Several dikes occur within Whiskeytown are a result of emplacement of the batholith.

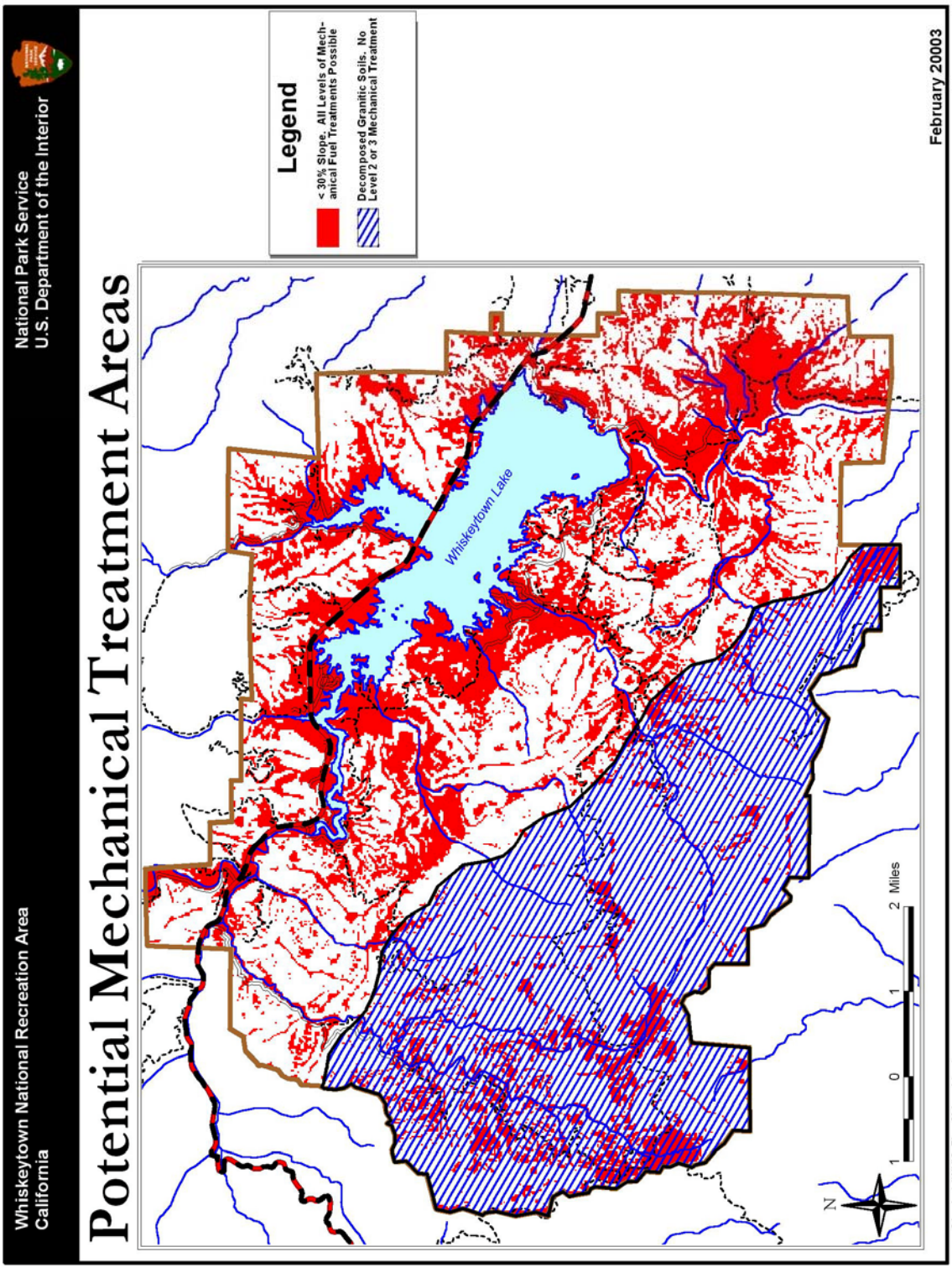
Whiskeytown has a long history of placer and ore mining that dates back to the 1850s. Two past igneous events, emplacement of the Mule Mountain stock and Shasta Bally batholith, created conditions for gold and base metal ore deposits. These deposits are not just within Whiskeytown, but are also exposed just outside of the park boundary. Most notable of these intrusions are the Iron Mountain and Birdseye porphyry. The Iron Mountain Copper- Zinc district was created when the Mule Mountain stock was intruded into the Copley greenstone. Metasomatic fluids migrating through fractures in the Copley greenstone melted base metals and transported these components for emplacement along a normal fault and fold. The Birdseye porphyry, a dike rock from the intrusion of the Shasta Bally, is the principle rock with spatial association to gold.

Soils

The soils within Whiskeytown are typical of soil formation within the Eastern Klamath Metamorphic Belt of the Klamath Geologic Province with the exception soils formed on the Shasta Bally batholith. Generally, soils within Whiskeytown can be described according to parent material, elevation, slope, and vegetation cover. The general Great Soil Groups in Whiskeytown as defined by the Natural Resource Conservation Service (formerly the Soil Conservation Service) consist of entisols, inceptisols, spodosols, alfisols, and limited mollisols. More specific soil descriptions vary on localized conditions.

The higher elevation steep slopes (greater than 30°) have poorly developed soils described as entisols and inceptisols. More specific, the decomposed granite entisols Shasta Bally batholith, which forms most of the high elevations on the south side of Whiskeytown can be described as saprolites, because no soil horizons exist except for vegetation laying on top of the decomposed granite. The inceptisols tend to be on less steep slopes with vegetation and exhibit a higher degree of soil formation than the entisols; usually having organic material incorporated and exhibiting weak horizon formation.

The lower altitudes of Whiskeytown tend to have less steep slopes (less than 30%) and mixed conifer, deciduous, and chaparral vegetation. These soils have a greater horizon formation than the entisols and inceptisols. Typical of these environments, spodosols and alfisols form depending upon the local vegetation cover. The spodosols form in more acidic conditions inherent to coniferous vegetation and the alfisols form in less acidic conditions in oak woodland and chaparral vegetation. The mollisols form in grassland environments.



Map of Decomposed Granite Areas (hatched) and Slopes within Whiskeytown National Recreation Area

Water Quality

Whiskeytown is a water- based recreation area with significant water resources that attract many visitors who enjoy the cool, clear water. Whiskeytown Lake covers 3220 surface acres with 240,000 acre- feet of water at full capacity, 1210 feet above sea level. Whiskeytown Dam impounds the Clear Creek watershed on the southeast end of the recreation area and the lake is fed by seven major watersheds, Clear Creek, Brandy Creek, Crystal Creek, Boulder Creek, Mill Creek, Willow Creek, and Whiskey Creek. During the dry summer months, Whiskeytown Lake receives most of is water from Trinity Lake via a 17 mile underground tunnel which empties in Whiskeytown Lake at the Carr Powerhouse at a maximum rate of 3200 cubic feet per second. Below the dam, the major tributary to Clear Creek is Paige Boulder Creek which drains into Clear Creek about one mile downstream from the Whiskeytown Dam. Additionally, many intermittent streams drain into Whiskeytown Lake. Several streams, most notably Cottonwood Creek, drain outside of the Clear Creek watershed. Whiskeytown Lake supplies power generation at the Spring Creek Powerhouse along the Sacramento River via an underground tunnel, irrigation for the California Central Valley crops, and drinking water for the Lower Clear Creek Water District.

Water quality within The park is generally of very high quality, although some watersheds are affected by acid mine drainage from past mining practices. The streams on the southern side of the recreation area flow through virtually pristine watershed conditions with a large snow pack component from the higher elevations. North side streams are known to or have the potential for acid mine drainage. Whiskeytown Lake provides clean, cool water year round.

Baseline data for the south side is gathered at a water quality monitoring station on Paige- Boulder Creek. The monitoring station gathers the following data:

- pH level
- specific conductivity
- temperature
- dissolved oxygen
- turbidity
- stage of flow

Paige- Boulder Creek is considered representative of the park's south side streams including Crystal Creek, Brandy Creek, Mill Creek, and Boulder Creek. The specific conductivity of Paige- Boulder Creek ranges from 30- 70 mmhos with an average of about 50 mmhos. The pH ranges from about 7.2 to a maximum of 8.2 with an average around 7.7. Turbidity ranges from 0- 100 NTU and dissolved oxygen is considered to be a saturation level and ranges from 9- 12 mg/l. Temperature ranges from 2- 25°C. These range values are seasonal and fluctuate with precipitation. The south side drainage's are impacted from past timber harvest activities, which have the potential to increase turbidity in the watersheds as the old logging roads deteriorate, introducing sediments into the system.

Watersheds on the north side of Whiskeytown all have past mining activities that have impaired or have the potential to impair water quality. Base metal and gold mining inside and outside of The park boundaries has left a legacy of acid mine drainage problems, and currently the National Park Service is quantifying the extent of the damage to these watersheds and the water that flows from them. These watersheds include Willow Creek and Whiskey Creek and other smaller tributaries on the north side also have potential for acid mine drainage. The only watershed that has been quantified is Willow Creek, which has its headwaters to the west of Whiskeytown and enters Clear Creek near the Tower House District. Large amounts of iron, zinc, aluminum, and lesser quantities of cadmium and other metals drain from the old Greenhorn Mine into Willow Creek and the waters of Whiskeytown Lake. Willow Creek is listed on the California State 303d list for non- attainment of water quality standards.

Biological impairment of Whiskeytown Lake in the form of fecal coliform and e. coli have been identified at three of the swim beaches Oak Bottom, East Beach, and Brandy Creek during summer recreational periods. These occurrences are rare and are not interpreted as chronic problems. Because of these isolated incidents, Whiskeytown Lake has been added to the California State 303d list non- attainment of water quality standards.

Wetlands/Floodplains

Whiskeytown has considerable wetland resources that are centered around Whiskeytown Lake, and as a result of the Whiskeytown Dam impoundment, has a minimal amount of functional floodplains above and below the dam.

The entire shoreline of Whiskeytown Lake is considered an artificial wetland, because of the seasonably stable height of the lake and its associated vegetation. Operation of the lake by the US Bureau of Reclamation maintains two seasonal shorelines, full pool at 1210 feet above sea level during the summer and approximately 1193 feet during the winter season. The standard operations of the US Bureau of Reclamation raises the lake elevation in April or May for the summer to accommodate recreation and lowers the lever in October or November for winter flood protection of the Sacramento River. These two discrete water levels form a seasonal zone of inundation that fluctuates fifteen to twenty feet vertically and about forty to fifty feet horizontally based on an average shoreline slope of twenty to twenty five degrees. Other smaller wetlands occur locally along streams both above and below Whiskeytown Dam.

When Whiskeytown Dam was constructed in the mid 1960s, it impounded Clear Creek, which altered the traditional hydrologic response of Clear Creek and the tributary creeks many miles above and below the dam. Clear Creek now only has a functional floodplain for about two miles as it enters the park's northernmost boundary. The historic pre- dam floodplain below the dam is no longer functional because of the diminished releases. The existing floodplain is overgrown with riparian vegetation and is incised within its channel. Other floodplains exist on the lake confluence with Brandy Creek and Boulder Creek and at the confluence of Clear Creek and Paige- Boulder Creek. Wetlands in these areas and up these major creeks have never be delineated.

Air Quality

Whiskeytown National Recreation Area is classified as a Class II airshed under the Federal Clean Air Act (42 USC 7401 et seq. as amended). The Federal Clean Air Act stipulates that federal land managers have an affirmative responsibility to protect a park's air quality- related values, including visibility, plants, animals, soils, water quality, cultural and historic structures and objects, and visitor health from adverse air pollution impacts. The Shasta County Air Pollution Control District regulates air quality issues within Whiskeytown. Air quality is an important issue when considering how park fire management policies affect the park/ urban interface. Since air quality would be affected in the short- term during any ignition event, it is an issue requiring analysis.

The Federal Clean Air Act, as amended in 1990, requires the Environmental Protection Agency (EPA) to identify National Ambient Air Quality Standards (NAAQS) to protect public health and welfare. Standards have been set for six pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than 10 microns (PM_{10}), and lead (Pb). In 1997, EPA promulgated a revised NAAQS for ozone and a new NAAQS for particulate matter less than 2.5 microns ($PM_{2.5}$). In the spring of 1999, an U.S. Court of Appeals panel remanded the standard to EPA for further consideration. However, in early 2001, the Supreme Court upheld EPA's authority to set these new more stringent standards.

While EPA's authority to set the new eight- hour ozone standard was upheld, the Supreme Court ordered it to rework its policy for implementing the new ozone standard in non- attainment areas. Although the Court of Appeals prohibited EPA from implementing the eight- hour ozone standard, it did note that the Clean Air Act required EPA to finalize area designations within specific timeframes. The California Air Resources Board (CARB) updated the proposed area recommendations with the most current air quality monitoring data and transmitted California's recommendations to EPA in July 2000. These recommendations include moderate non-attainment designations for the federal 8- hour standard for the Sacramento Valley air basin.

Table 3-4 Federal and California ambient air quality standards

Pollutant	Averaging Time	Standards			Objective of Standard
		Federal		California	
		Primary	Secondary		
Ozone (O_3)	I hour	0.12 ppm	0.12 ppm	0.09 ppm	Prevent breathing difficulties, eye irritation, and biological impacts to sensitive species
	8 hours	0.08 ppm	0.08 ppm	NS	
Carbon monoxide (CO)	1 hour	35 ppm	35 ppm	20 ppm	Prevent carboxyhemoglobin levels greater than 2%
	8 hours	9 ppm	NS	9 ppm	
Nitrogen dioxide (NO_2)	1 hour	NS	NS	0.25 ppm	Prevent breathing difficulties, reduce smog formation, and improve visibility
	Annual average	0.053 ppm	0.053 ppm	NS	
Sulfur dioxide (SO_2)	1 hour	NS	NS	0.25 ppm	Prevent increased respiratory disease, acid rain, crop damage, odor nuisance and improve visibility
	3 hours	NS	0.5 ppm	NS	
	24 hours	0.14 ppm	NS	0.04 ppm	
	Annual average	0.03 ppm	NS	NS	
Respirable Particulate Matter (PM_{10})	24 hours	150 g/m^3	150 g/m^3	50 g/m^3	Prevent chronic respiratory tract diseases and improve visibility
	Annual mean	50 g/m^3 (arithmetic)	NS	30 g/m^3 (geometric)	
Fine Particulate Matter ($PM_{2.5}$)	24 hours	65 g/m^3	65 g/m^3	NS	
	Annual mean	50 g/m^3 (arithmetic)	50 g/m^3 (arithmetic)	NS	
Lead (Pb)	30 days	NS	---	1.5 g/m^3	Prevent neurological system damage
	Calendar quarter	1.5 g/m^3	1.5 g/m^3	NS	
Sulfates	24 hours	NS	NS	2.5 g/m^3	Improve visibility and prevent health impacts
Visibility	One observation	NS	NS	No reduction in prevailing visibility to <10 miles when relative humidity is <70%	Reducing particles
Hydrogen Sulfide	1 hour	NS	NS	0.03 ppm	Prevent odor nuisance

ppm = parts per million
g/m^3 = micrograms per cubic meter
NS = no standard

The pollutants are called criteria pollutants because the standards satisfy criteria specified in the Act. An area where a standard is exceeded more than three times in three years can be considered a non- attainment area subject to planning and pollution control requirements that are more stringent than areas that meet standards.

Air quality in the park is affected by internal and external air pollution sources. Internal air pollution sources include campfires, woodstoves, and barbecues. Area air pollution sources include prescribed and wildland fires and motor vehicle emissions.

While air quality in an air basin is usually determined by emission sources within the basin, pollutants transported from upwind air basins by prevailing winds can also affect it. Transport studies done by researchers from the University of California, Davis and Sacramento CARB have been inconclusive as to the origin of pollutants in Shasta County. The most recent designation from CARB is that emissions in the Sacramento Valley Air Basin are the result of "Inconsequential Transport." Air quality in the Sacramento Valley Air Basin is affected by pollutants generated locally, transported from metropolitan Sacramento, and sometimes is a combination of the two.

The California Air Resources Board has set ambient air quality standards that are stricter than the national standards to protect public health and welfare. Under the 1988 California Clean Air Act, air basins were designated as attainment, non- attainment, or unclassified for the state standards.

State implementation plans define control measures that are designed to bring areas into attainment. The Sacramento Valley Air Basin is currently in attainment for all NAAQS but is designated as non- attainment for ozone and PM_{10} NAAQS. There is only a Federal standard for $PM_{2.5}$, for which a designation would be made shortly for Shasta County. The County has completed measuring three years worth of data for $PM_{2.5}$ and it is likely that it would also be designated as non- attainment. Shasta County has ceased measuring carbon monoxide, nitrogen dioxide, and sulfur dioxide due to recordings well below the State and Federal standards. Basic components of a state implementation plan include legal authority, an emissions inventory, an air quality monitoring network, control strategy demonstration modeling, rules and emission limiting regulations, new source review provisions, enforcement and surveillance, and other programs as necessary to attain standards.

The California Air Resources Board is responsible for promulgating regulations pertaining to a variety of areas, including state ambient air quality standards and area designations, emissions from motor vehicles, fuels and consumer products, and airborne toxic control measures. Title 17 of the California Code of Regulations, entitled "*Smoke Management Guidelines for Agricultural and Prescribed Burning*," provides direction to air pollution control and air quality management districts (air districts) for the regulation and control of agricultural burning, including prescribed burning. These guidelines are intended to provide for the continuation of prescribed burning as a resource management tool, while minimizing smoke impacts on the public. Shasta County Air Pollution Control District has the primary responsibility for control of air pollution from prescribed burning in Whiskeytown, with regulatory authority provided in Rule 307 "*Wildland Vegetation Management Burning*."

Table 3-5 Status of ambient air quality designations for Shasta County

	California Standard	Federal Standard
Ozone (one hour)	❍	●
Carbon monoxide	●	●
Nitrogen dioxide	●	●
Sulfur dioxide	●	●
Particulate matter	❍	●
Lead	●	*

● - Attainment of standard
❍ - Non-attainment of standard
*** EPA does not designate areas for the lead standard in the same manner as for other pollutants. However, there are no areas in California that exceed the national standard for lead.**

The air district rules generally specify that the agency planning a burn must notify the air district and provide basic information. These include burning location, acreage, vegetation type, fuel conditions, schedule, location of sensitive receptors, and other information.

EPA has promulgated regional haze regulations to improve visibility or visual air quality in national parks and wilderness areas across the country (EPA 1999). In developing these rules, EPA recognized that fires of all kind, including prescribed fire and wildland fires contribute to regional haze and that there is a complex relationship between what is considered a natural source of fire versus a human- caused source of fire. Given that in many instances the purpose of prescribed fires is to restore the natural fire cycles to forest ecosystems, EPA is working with states and federal land managers to support development of enhanced smoke management plans to minimize the impacts of fire emissions on pubic health and welfare.

As noted earlier in Chapter 1, a principal management objective is to manage air quality impacts of prescribed burning by working with county and state air resources personnel and using the latest technology to monitor and manage smoke- related impacts upon visitors, residents, and employees. In addition to complying with state and local air quality rules and regulations, the National Park Service also has developed guidance on air quality and smoke management related to wildland and prescribed fires. This guidance is contained in Chapter 14 of the National Park Service Reference Manual 18: *Wildland Fire Management* (1999). Guidance and policies from EPA also supplement the National Park Service guidance. These include the *Interim Air Quality Policy on Wildland and Prescribed Fires, Federal Wildland Fire Management Policy*, and *PM_{10} Natural Events Policy*. In 1998, EPA developed an interim policy for addressing public health and welfare impacts caused by wildland and prescribed fires that are managed to achieve resource benefits. Ambient air quality worse than the national ambient air quality standards for $PM_{2.5}$ and PM_{10} is used as the principal indicator of public health impacts. Visibility impairment is used as the principal indicator of public welfare impacts. This policy complements the *PM_{10} Natural Events Policy* to address public health impacts caused by wildland fires.

One of the objectives of CARB and National Park Service mandates and policies is to minimize smoke impacts on people and sensitive receptor areas in and near the park. Such areas can include towns, villages, hospitals, schools, nursing homes, shopping centers, campgrounds, recreational areas, trails, public events, scenic vistas, and Class I areas.

Prominent sensitive receptors in the area adjacent to Whiskeytown were selected based on guidance in the California Code of Regulations Title 17 *Smoke Management Guidelines for Agricultural and Prescribed Burning,* regional demographics and population dynamics, local wind patterns, climate conditions, smoke transmission/fire behavior, and input from affected air districts.

Table 3-6 Prominent sensitive receptors in and around Whiskeytown National Recreation Area

Receptor	Location
Town of Old Shasta	Directly adjacent to the east boundary of the park
Town of French Gulch	1.2 miles north of the park
Town of Igo	2 miles south of the park
Town of Whiskeytown	Inside park
City of Redding	6 miles east of the park
Whiskeytown Environmental School	Inside park

In 1993, EPA adopted regulations implementing section 176 of the Clean Air Act as amended. This section requires that federal actions conform to state implementation plans for achieving and maintaining the national standards. Federal actions must not cause or contribute to new violations of any standard, increase the frequency or severity of any existing violation, interfere with timely attainment or maintenance of any standard, delay emission reduction milestones, or contradict State Implementation Plan requirements. The conformity rule applies only in federal non- attainment areas, such as Shasta County.

Cultural Environment and Special Designations

In addition to a diverse mosaic of natural and physical features, Whiskeytown contains an equally varied array of cultural resources within its boundaries. The National Park Service recognizes five types of cultural resources: archeological resources, structures, ethnographic resources, cultural landscapes, and museum objects. Archeological resources are the remains of past human activity and records documenting the scientific analysis of these remains. These include artifacts, eco-facts, and features. Structures are material assemblies that extend the limits of human capacity, and comprise such diverse objects as buildings, bridges, vehicles, monuments, vessels, fences, and

canals. Ethnographic resources are basic expressions of human culture and the basis for continuity of cultural systems and encompasses both the tangible (languages, subsistence activities) and intangible (oral traditions, religious beliefs). The management of ethnographic resources entails the recognition that traditional cultures can have different worldviews and the right to maintain their traditions. Cultural landscapes are settings we have created in the natural world. They are intertwined patterns of natural and constructed features that represent human manipulation and adaptation of the land. Finally, museum objects are manifestations and records of behavior and ideas that span the breadth of human experience and depth of natural history. Examples of typical museum objects include field and laboratory notes, artifacts, and photographs (National Park Service 1997).

Archeological Resources

To date, a total of 116 archeological sites and 299 isolated artifacts and/or features have been formally documented within Whiskeytown. Of the former, 43 comprise prehistoric or ethnographic components, 41 with historic components, 25 with mixed prehistoric/ethnographic and historic components, and seven of unknown vintage (Bevill and Nilsson 2001). Roughly 3250 acres, or 8% of the non- lake portion of the park, have been surveyed for archeological resources. The earliest archeological surveys were conducted in the late 1950s prior to the construction of the Clair A. Hill/Whiskeytown Dam. These were followed by inventories initiated to fulfill requirements set forth in Sections 106 and 110 of the National Historic Preservation Act (NHPA). Since at least the late 1980s, most survey projects in Whiskeytown have employed more rigorous methods in regard to the identification and evaluation of archeological resources than previous investigations. Recently, the scope and scale of archeological surveys has increased in response to the rapid growth of the Whiskeytown fire management program. Eleven archeological sites at Whiskeytown have been subjected to archeological excavations. These ranged from small- scale testing projects to full- fledged data recovery efforts.

Archeological investigations at Whiskeytown revealed Native American occupation spanning at least 8000 years (Bevill and Nilsson 2001). On the basis of shifts in artifact types and styles and adaptive modes through time, five distinctive archeological patterns have been identified in the archeological record of the Whiskeytown region (**Table G**). Native American archeological sites at Whiskeytown consist almost exclusively of habitation sites and lithic scatters. The former are characterized by the presence of dark midden soil, architectural remains, diverse artifact assemblages, faunal remains, and, on occasion, human remains. Habitation sites represent long-term seasonal or permanent use. Bevill and Nilsson (2001) identified 43 recorded habitation sites at Whiskeytown. Major excavations were conducted at the Tower House Site, a large habitation site located at the confluence of Clear and Willow creeks (Bevill and Nilsson 1999), and several others on lower Clear Creek and Boulder Creek have been subjected to limited testing (Eidsness 1988; Bevill and Nilsson 1996). Twelve lithic scatters have been documented at Whiskeytown (Bevill and Nilsson 2001). Lithic scatters are typically comprised of flaked stone tools and waste flakes, sometimes ground stone, and probably resulted from one or more occupational episodes. Obsidian from sources to the north and east of Whiskeytown account for the majority of the raw material represented in flaked stone tools and waste flakes, although locally available chert and igneous types are not uncommon. The distribution of Native American archeological sites at Whiskeytown appears to have been influenced by the occurrence of perennial or reliable intermittent water sources, with most sites found in close proximity to these features. The majority of these sites lie between 1000 and 2000 feet in elevation, although this may reflect survey coverage rather than actual settlement preferences.

Table 3-7 Archaeological patterns in the Whiskeytown region

Pattern	Date	Diagnostic Artifact/Feature	Adaptive Modes
Augustine	1500-150 BP	Gunther barbed, desert series projectile points *Chert blades* *Stone pendants* *Incised bone/stone objects* *Shell beads and ornaments* *Bone tools* *Hopper mortars and pestles* *Baked clay figurines* *Flexed burials* *House depressions*	Represent occupation by Wintu peoples
Tehama	1800-700 BP	Gunther barbed, small & medium notched points *Hoppers mortars and pestles* *Milling stones and hand stones* *Notched pebble net weights*	Viewed as continuation of the Whiskeytown pattern adaptive mode. Marked by introduction of bow and arrow.
Whiskeytown	3000-1700 BP	Clikapudi/Whiskeytown notched projectile points *McKee unifaces* *Milling stones and hand stones* *Mortar and pestles* *Notched pebbles* *Abundant fire-cracked rock*	Large occupation sites located near major streams indicate seasonal utilization of riverine resources.
Squaw Creek	5000-3000 BP	Squaw Creek contracting stem and leaf/diamond-shaped projectile points *McKee unifaces* *Cobble spall tools* *Milling stone and hand stones* *Bowl mortars and pestles* *Incised stones*	More intensive occupation than preceding Borax Lake pattern. Acorns and riverine resources adopted in diet.
Borax Lake	8000-5000 BP	Wide-stemmed projectile points *Milling stones and hand stones* *Schist and phylite knives*	Emphasis on large game hunting, seeds also utilized. Sites concentrated on major high, elevated ridges. Inhabitants highly mobile.

(adapted from Bevill and Nilsson 2001)

Archeological resources related to the non- Native American presence at Whiskeytown have received little serious attention until relatively recently. Bevill and Nilsson (2001) identified 66 recorded sites with historical components, including 41 single component resources, and 25 of both historical and prehistoric vintage. The historical components relate to mining, homesteading, farming/ranching, and logging. Artifacts and features commonly associated with these site types are presented in **Table H**. Of those sites containing diagnostic artifacts or features, five date to the Gold Rush period (1848- 1843), five to the hydraulic mining period (late 1800s), nine to the copper mining period (1884- 1919), and 17 from 1920- 1950s. Historical archeological components are found almost exclusively at elevations below 2000 feet, and often on gently sloping terrain near water. Again, this distribution is probably a reflection of survey coverage.

Table 3-8 Affiliation of Historic Archaeological Sites

Site Type	Examples of Artifacts and Features	Number
Mining	Adits, prospect pits, ditches, ore cart tracks	44
Homestead	Foundation, domestic trash	9
Trash scatter	Cans, bottles or other non-industrial materials w/o associated features, structures	7
Settlement	Multiple foundations, domestic trash, economic activities	3
Sawmill	Mill features, lumber activities	1
Ranching/farming	Corrals, barn foundations, fences, irrigation ditches	2

(adapted from Bevill and Nilsson 2001)

To this point, submerged archeological resources at Whiskeytown have failed to receive much attention. Twenty- four archeological sites were documented within the high water mark of Whiskeytown Lake during the initial survey (Treganza and Heickson 1960); this number is unquestionably a major underestimation. Furthermore, the middle reaches of the Clear Creek watershed were a focus of activity from the 1850s onward, and these remains were virtually ignored during the first survey. However, the bed of the reservoir was prepared by removing and piling trees and brush with bulldozers, during which time the integrity of these resources was almost certainly compromised to at least some degree.

Two archeological districts and seven archeological sites in Whiskeytown are listed or have been formally determined eligible for listing on the National Register of Historic Places. The Tower House Archeological District comprises 10 archeological sites, and was listed on the National Register in 1985 (Bevill and Nilsson 2001). The contributing sites are located on and near the confluence of Clear, Willow, and Mill creeks. Among these are several habitation sites, one of which (Tower House Site) has undergone excavation on several occasions, and was occupied perhaps as early as 8000 BP (Bevill and Nilsson 1999). The Tower House Archeological District was nominated based on the potential to yield information on the initial occupation of the region, as well as prehistoric human adaptations to riparian and woodland environments, and the ability to perform comparisons of material cultural between sites. Although nominated due to association with Native American occupations, several of the contributing sites also contain historical components, including materials associated with the Tower House Historic District, described in greater detail below.

The Lower Clear Creek Archeological District is comprised of six archeological sites located in the Clear Creek watershed below Whiskeytown Dam (Anderson et al. 1979). Each of these possesses Native American components, including substantial villages containing house pits and midden. Historical components, reflecting mining and homesteading, are also found on four of the sites. One of the sites within the district, CA- SHA- 177/H, was excavated in 1970 and 1971 in anticipation of proposed construction activities (Johnson and Skjelstad 1974). These investigations revealed a meter- deep midden deposit containing flaked stone tools and debitage, ground stone, and assorted historic artifacts. Several methods and analyses that were uncommon at the time were employed, including use of fine- meshed screens, flotation to recover botanical remains, and pH testing. The primary significance of the district was seen to lie in the potential for buried and surface deposits to provide comparative data for local and regional archeological and environmental studies. Specifically, the Native American components could contribute to an understanding of regional cultural history, social organization, and the use of available biotic and abiotic resources. The district was determined eligible for listing on the NRHP, but never formally entered. In 1986, small- scale subsurface testing was performed at several of the district sites with the intent of obtaining additional information on site content and integrity (Eidsness 1988).

The Clear Creek Ditch, a forty mile- plus long water conveyance system constructed in the early 1850s, was evaluated in conjunction with a Federal land exchange project east of Whiskeytown and determined to be National Register eligible (Bevill and Nilsson 2001). The ditch originates in Whiskeytown, and portions of it are maintained through use as a recreational trail. The Boulder Creek Site was tested in 1996 (Bevill and Nilsson 1996). Excavation revealed dark midden soil, flaked stone tools and waste flakes, and faunal remains dating to the last 3000 years. The site was interpreted as a seasonal field camp utilized for hunting and gathering forays, and was formally determined to possess National Register eligibility.

Hamusek- McGann et al. (1999) evaluated eighteen mining sites throughout Whiskeytown in conjunction with an Abandoned Mineral Lands project. The Mount Shasta Mine, Oro Fino/Gentle Annie Mine, Monitor Mine, Desmond Mine and Ganim Mine were all formally

determined to be eligible for the National Register. Meanwhile, 10 other mine sites were found to lack attributes consistent with inclusion on the National Register.

The relative paucity of archeological sites at Whiskeytown listed on the National Register or formally evaluated for significance is more a reflection of the nature of National Park Service management practices than the condition of the archeological record. For example, the preservation mandate provides for the utmost consideration of the impacts of a given undertaking on the cultural, natural, and physical environment, and the project specifics and location would generally be revised if resources cannot be avoided as planned. Thus, relatively few sites are excavated and/or documented in greater detail. While probably no archeological resources at Whiskeytown have escaped at least some type of disturbance, those that remain assume even greater importance. Many large Native American habitation sites that formerly lined the margins of Clear Creek were destroyed during the construction of Whiskeytown Dam, lending to the significance of those habitation sites along Clear Creek above and below the dam. That the Boulder Creek Site was found to possess elements consistent with inclusion on the National Register suggests that other relatively intact habitation sites found at the middle elevations in Whiskeytown are also worthy of significant status. Irrespective of site significance and integrity, contemporary Native Americans with links to the Whiskeytown area are very concerned with the disposition of the physical and material remains of their ancestors (Emberson 2000). Finally, the construction of Whiskeytown Dam also resulted in the inundation of innumerable historical archeological resources, those dating to the earliest periods of use in particular. The sites that remain are critical for filling a void in local cultural history information.

While the region encompassing Whiskeytown is also rich in Native American and historical archeological resources, many of these are at risk from the rapid growth of the Redding metropolitan area, as well as multiple- use practices associated with those on adjacent public lands. As such, with proper management, Whiskeytown offers the potential to preserve and protect a large assemblage of diverse archeological resources in perpetuity.

Structures

Relatively few historic structures are found in Whiskeytown. Thirty historic structures are listed on the List of Classified Structures (Appendix B), most of which are found in the vicinity of the Tower House area. The Tower House Historic District was listed on the National Register in 1973 (Bevill and Nilsson 2001). Centered on the confluence of Clear, Willow and Mill creeks, the district is composed of 14 individual features that encompass the period from about 1850- 1920. This complex marks the location of the first permanent Euro American settlement in the region when two entrepreneurs, Levi Tower and Charles Camden, established a hotel and way station in 1851. While Tower died in 1865, Camden remained until the early 1900s and amassed a small fortune and solid reputation through mining and water diversion enterprises, as well as public works projects. Many of the features attributable to Tower and Camden were in an acute state of disrepair when the National Park Service took possession in the late 1960s. Restoration projects have rendered the Camden and Tenant houses habitable, and the grounds and other features cleaned up and variously restored. (See Table on next page).

Table 3-9 Contributing features of the Tower House Historic District

Tower House Hotel site
Camden House
Camden House outbuildings, including a garage and carriage house
Remnants of footbridge over Willow Creek
Apple orchard
Levi Tower grave
Open pasture
Barn
Tenant House
Stone and concrete remnants of bridge over Clear Creek
El Dorado/Bickford Mine
Irrigation system from Crystal Creek to the Camden House
Graves of Kate Camden and two others
Camden sawmill site

(adapted from Bevill and Nilsson 2001)

The Tower House Irrigation System District has been determined eligible for inclusion on the National Register, but not yet formally listed (Bevill and Nilsson 2001). It comprises a water conveyance system that originates at Crystal Creek and flows east to the Tower House area. Contributing elements include ditches, flumes, pipes, rock walls, a dam, a clean- out house, and redwood storage tank. A couple of ditches that are a part of this district were recently documented in greater detail (Davis- King 1997).

More recent structures and complexes, including the John F. Kennedy Commemorative Panel, Judge Carr Memorial, NEED Camp, and Central Valley Project features, have been recommended to lack National Register eligibility, often for failing to meet the 50 year- old minimum age requirement. Bevill and Nilsson (2001), however, recommended that some of these features be considered for significance due to the fact that many would soon be 50 years old, and for relation to bygone trends in local and/or national history. For example, the NEED Camp was born out of the cultural and intellectual renaissance of the 1960s. Implementation of the National Environmental Education Development (NEED) program led to the construction of many such environmental camps across the nation. Very few of these exist today, and only the NEED Camp, now called the Whiskeytown Environmental School, serves in its original capacity.

Ethnographic Resources

No unequivocal ethnographic resources, or Traditional Cultural Properties , at Whiskeytown are listed on the National Register. However, the recently completed *Ethnographic Overview and Traditional Use Study of Native American Affiliation at Whiskeytown* identified a continuation of use and strong concern for the well being of natural and cultural resources in the park by the Wintu Indian community (Emberson 2000). The Wintu continue to utilize Whiskeytown for a variety of traditional purposes, including gathering (basketry materials, medicinal plants, religious purposes), subsistence activities (hunting and fishing), educational activities to promote traditional culture, and religious functions.

More than 100 species of native plants are currently utilized by the Wintu, many of which are found at Whiskeytown (Emberson 2000). The Wintu have expressed strong interest in developing a written gathering policy for Whiskeytown, including the identification and proper maintenance of gathering sites through such actions as pruning and prescribed burning. As their former

territory is developed with increasing rapidity, the Wintu would look to Whiskeytown as a reliable source for diminishing traditional resources, and are fully supportive of any management practices that enhance the viability of those resources.

While Wintu consultants have declined or are unable to provide specifics, a number of locations with cultural/spiritual significance ("sacred sites") are found at Whiskeytown (Emberson 2000). Shasta Bally has been identified as a significant area in previous consultations, and a possible ceremonial site is recorded in that area. The Wintu suggest that the development of respectful and cooperative relationships with Whiskeytown staff would result in greater willingness to divulge the location and nature of such sites as needed for proper management and protection.

As noted above, contemporary Wintu are very concerned about the disposition of Native American archeological resources within Whiskeytown. Consultants felt that sites containing human remains should be left undisturbed, and measures taken to protect them from vandalism and inadvertent damage. Native American artifacts are seen as important educational tools, and it has been recommended that objects could be displayed in a cultural center.

The Wintu hold an annual camp at the Whiskeytown Environmental School for the purpose of educating children about traditional culture (Emberson 2000). The organizers are vitally concerned with the continued existence of this camp in cooperation and conjunction with Whiskeytown staff. Along with this is a desire to work more closely with National Park Service staff, including guidance regarding the public interpretation of Wintu culture and cultural sensitivity training. This is supported by the preference of most consultants to favor Alternative C of the Whiskeytown General Management Plan, which proposed to reduce soil erosion, restore and improve vegetation communities with prescribed fire and other techniques, identification and protection of cultural resources, expansion of interpretive services, and promotion of assistance from the Wintu community in maintaining cultural traditions.

No extant Indian Trust Resources are found at Whiskeytown. However, Wintu families reportedly occupied several Indian Allotments within the park in the early to mid 1900s (Bevill and Nilsson 2001). Most of these were located along Clear Creek between the Tower House and Boulder Creek.

Cultural Landscapes

Three cultural landscapes potentially eligible for listing on the National Register have been identified at Whiskeytown. These include the Tower House Historic District, the Mount Shasta Mine complex, and the Lower Clear Creek Archeological District. A draft Cultural Landscape Report was recently prepared for the Tower House Historic District (Historical Research Associates 2001). The study focused on the 20- acre area encompassing the Camden and Tenant houses, as well as surrounding remnants of orchards, pastures and water ditches. A great deal of change was documented from the period of significance including overwhelming representation of elements dating from 1900 to 1940, loss of ornamental and agricultural vegetation, and construction of modern State Highway 299. Nonetheless, the cultural landscape does retain integrity, including the Camden and Tenant house complexes, and agricultural fields. It was recommended that the boundary of the Tower House Historical District be altered to better reflect the land ownership of Charles Camden and Levi Tower, more thoroughly document the importance of Charles Camden, and change the period of significance to 1862 to 1935 (Historical Research Associates 2001). Suggested research included better documentation of fruit and ornamental trees, including extraction of fruit samples and cuttings, and additional archeological investigations.

Museum Objects

Whiskeytown maintains a significant collection of historical, archeological and natural history specimens. Presently, nearly 213,000 objects are found in the collection, the vast majority of which are archeological remains. These materials have contributed significantly to the understanding of prehistory in the northern coast range and upper Sacramento Valley, and offer an excellent opportunity for education and future research. Uncataloged items include archival materials associated with the administrative history of Whiskeytown, including natural and cultural resources management and research. A large collection of mining tools retrieved from park archeological sites has yet to be adequately documented. In all likelihood, the Whiskeytown collections would continue to grow as a result of current and future management and research related projects.

The present curation facility at Whiskeytown meets National Park Service standards (36 CFR 79) in regard to environmental control, fire protection, and security. However, the facility is much too small to accommodate the existing collection, and is certainly inadequate to fulfill future needs. In addition, Whiskeytown lacks a full- time curator, resulting in frequent cataloging backlogs.

Social Environment

Compatibility with land use plans

The lands adjacent to Whiskeytown National Recreation Area are owned by a variety of public and private entities. Boundary land tracts vary from entire sections owned by timber companies, such as Sierra Pacific Industries, to small subsections of private parcels. Land uses vary from residential use to timber extraction and recreation. The National Park Service has direct fire protection authority for the lands within the boundaries of Whiskeytown National Recreation Area. The California Department of Forestry and Fire Protection has direct protection authority for the lands surrounding the Recreation Area. Several cooperative agreements are in place to jointly manage fire and fuels activities in the local area. The risk associated with the fuels buildup is well recognized as a regional problem that crosses administrative boundaries

Whiskeytown has a significant wildland/urban interface on its east and north boundaries. Fire managers at Whiskeytown work closely with adjacent landowners through fuels committees, such as the Upper and Lower Clear Creek Watershed Groups, and through regional cooperative land use teams, such as the Shasta- Tehema Bioregional Council. These groups develop cooperative plans and share fire information between government and private entities in the region.

Whiskeytown actively works and plans with California Department of Forestry, Western Shasta Resource Conservation District (WSRCD), and the Bureau of Land Management with joint projects such as burns and shaded fuel break construction, prevention programs, and the proposed fire management plan has been developed as a tool in accomplishing regional fire management and fuel reduction goals. The proposed Whiskeytown shaded fuel break system is linked with adjacent lands and was developed as a joint project with the WSRCD and California Department of Forestry. The proposed Fire Management Plan complements the interagency and cooperative landowner efforts to manage fire and fuels on a regional basis.

Health and Safety

The health and safety of firefighters and the public is the highest priority in every action undertaken as it relates to firefighting strategy and tactics. There are two major concerns related to health and safety issues. One is the actual danger of fire- caused injuries or fatalities –

firefighters, visitors, or residents becoming trapped and directly burned by fire, or injuries that are indirectly caused by the fire incident such as injury or death from falling rocks and trees, or losing balance and falling. The second major health and safety concern comes from smoke inhalation - either by firefighters on the fire line or by the public in areas away from the fire.

Since smoke is produced by individual fire events, it must be managed and mitigated at that level. Important elements in considering appropriate smoke management actions include distance of the fire from the population of concern, local weather conditions affecting smoke movement, duration of exposure, and the type of fuel being burned.

The direct risk to the health and safety of personnel on the fire line is a major issue and is addressed through adherence to standards designed to limit wildland fire personnel exposure to health and safety threats. Firefighter and public safety is the first consideration on any fire event and all fire actions would be based on providing for safety. There is no history in the park of death or injury to visitors or residents directly caused by wildland fire, although the potential for injuries or fatalities exists. The park's fire program works to mitigate long- term threats to public safety by reducing hazardous fuels with the use of prescribed fire and mechanical fuel reduction around developments and along roadways where visitors could become trapped by fire.

Community Economics

Fire programs affect local community economics through several avenues – the most important variables include: the size of the fire management payroll, the amount of goods and services purchased by the program from local businesses, and impacts of fire operations and smoke events on the number of visitors moving through the community and presumably purchasing goods and services from local businesses.

For more information on the socioeconomic setting for Whiskeytown, please refer to the General Management Plan Environmental Impact Statement completed in 1999.

The frequency and size of fires also significantly affects the local economy, as the amount of money brought into a community varies from year to year. The suppression costs involved in fighting infrequent, large, unwanted fire events such as the 1990 Kanaka fire, which eventually burned over 3000 acres of parkland, benefit local merchants to a large degree.

Unwanted wildland fires also affect tourism, especially when road or facilities are closed due to fire operations. Over the past decade, such road closures have occurred infrequently for short periods of time on the primary thoroughfare through the park, California Highway 299. All of the closures were a result of fire suppression operations resulting from the need to fight unwanted wildland fires.

Offsetting potential tourism business lost in communities affected by closures is the financial impact of firefighting efforts that are usually associated with such closures. In all cases over the past ten years where this has occurred, numerous commercial lodgings, restaurants, and other local business benefited providing for the needs of the firefighters involved in the suppression effort.

Recreation

Approximately 775,000 visitors come to the park each year to enjoy the natural resources, participate in recreational and educational opportunities, and as a social experience. Primary recreational opportunities in the park include camping, hiking, swimming, boating, horseback riding, fishing, and wildlife viewing.

The vast majority of visitors to Whiskeytown come in the hot summer months to recreate by and in the lake. This is the time of year when campgrounds are open and more families visit the park on vacations. The average length of a visitor's stay also increases dramatically in the summer due to the overnight stays. Day use visitors in the summer also tend to stay longer due to relatively cooler temperatures and extended daylight hours, which provide visitors with the opportunity to seek relief from the heat for a longer period of time.

The area proposed for the relocation of a new fire cache facility, Oak Bottom, is the most popular overnight RV/camping area—in all likelihood, as a result of the easy access from Highway 299. The Oak Bottom area is managed through a concession relationship and also contains a small store, a marina, an amphitheater and a day use swim beach. Currently one fire engine is stored in an administrative zone within the Oak Bottom area.

Visual Resources

Probably the best example of a visual resource at Whiskeytown can be appreciated from the parking lot at the Visitor Center at the junction of Highway 299 and Kennedy Memorial Drive. On a clear day, a stunning view westward captures majestic Shasta Bally looms protectively over Whiskeytown Lake. Shasta Bally and nearby points such as Kanaka Peak, South Fork Mountain and Buckhorn Bally are sometimes cloaked in snow, adding to the dramatic view. The lake is a stretch of blue water that starts just below the steep hillside below the vantage point and continues out along the south edge of Highway 299.

Upon closer viewing, however, a series of structures and human- caused landscape modifications are noticed. These are the legacy of dam construction, transportation, logging and mining activity upon which the economy of the area was built. Transmission lines lay across the foothills of Shasta Bally and transmit power from the Carr Powerhouse at the western edge of the lake. Immediately below the Visitor Center a string a buoys hold up a water curtain designed to moderates water temperature near the Spring Creek tunnel. Most noticeable is Highway 299 that connects Redding with the Pacific Coast. Highway road cuts in some areas are significant as the highway travels along the north side of the lake. Utility line corridors parallel the road and are also readily apparent—the vegetation along Highway 299 is primarily brush and requires utility companies to actively reduce the number and size of these plants so that access is facilitated and fire hazards are reduced.

Other visual resources in the park include areas from various vantage points alongside trails and many of the park's roads. Many of these focus on the lake and views of mountains outside of the park (Mt. Shasta, Lassen Peak, and the Trinity Alps). Vantage points that portray some of the park's other scenic resources are known to certain groups, such as equestrians and hikers, but are not as easily accessible or as well known as those along Highway 299. The park is embarking on an effort to recognize some of these less well known areas and increase visitation to them.

Fire management activities in the form of roadside shaded fuel breaks have occurred along some of the more traveled roads in the park (Kennedy Memorial Drive and Muletown Road). This activity consists of cutting back brush and some shrubs so drivers are better able to see into the woodland and around sharp corners and to also reduce fuel loading in proximity to the roadway. In some areas where very tall manzanita and other brush species dominate, 'feathering' occurs in which irregular patterns of plants are left in order to more closely approximate a natural growing pattern. In wooded areas, ladder fuels are removed, as are some shrubs and chipped on sight. The chipped surface inhibits native and invasive ground cover growth for a few years, and creates a 'park like' view. Inhibiting grass and herb growth along these roads has the added benefit of reducing the risks of human caused fire from careless cigarette litter or from vehicles.

Impact topics considered but dismissed

Federal legislation, regulations and executive orders require that all Environmental Impact Statements consider a variety of resource issues. Mandatory topics that were considered, but not analyzed in detail are discussed below.

Energy requirement and conservation potential

Federal regulation (40 CFR 1502.16) requires that this document address a discussion of the energy requirements and conservation potential for each alternative and mitigation measure. Although the different management actions described in each of the alternatives differ in impact to the environment, none are noted as having significantly greater or lesser requirements. The use of mechanical treatment equipment may potentially require increased amounts of fossil fuels relative to vehicles transporting hand treatment crews. However this increase is not significant in either quantity of fuel and/or duration of use.

Mechanical treatment level 3 may increase accessibility of biomass material to be used in the production of electricity. This activity is found only in Alternative IV and would be employed on a site- specific basis. There is currently not enough information to conduct an analysis of the beneficial energy impacts that this action would have.

An argument can be made that the conservation potential of Alternative I, II and IV is greater than that of Alternative III because that alternative's emphasis on reactive actions (suppression) and associated increased resource expenses. A "conservation" cost- benefit analysis of suppression activity versus proactive actions (prescribed burning, mechanical treatment) would need to be completed—and is, in fact, the purpose of this document. No other discussion of energy requirements and conservation potential, aside from discussion of the environmental consequences of each alternative, is found in this document.

Unique agricultural lands

Federal regulation (40 CFR 1508.27) requires that impacts to prime or unique agricultural lands be addressed in every Environmental Impact Statement. There are no prime or unique agricultural lands in Whiskeytown National Recreation Area. No prime or unique agricultural lands would be affected by the adoption of any of the alternatives analyzed in this document. Accordingly, impacts on prime and unique agricultural lands are not analyzed in further detail in this document.

Environmental justice

Executive Order 12898, dated February 11, 1994, requires each Federal agency, to the greatest extent practicable and permitted by law, to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental impacts, including social and economic impacts, of its programs, policies, and activities on minority populations and low- income populations in the United States and its territories, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands.

For a more complete discussion of the socioeconomic setting of Whiskeytown, please refer to the General Management Plan Environmental Impact Statement.

None of the alternatives analyzed in this plan would result in a disproportionately high and adverse human health or environmental effect, including social and economic impacts, on minority populations or low- income populations. Outreach to local communities was conducted as part of the scoping process used to produce this Draft Environmental Impact Statement. Residents of local communities and the general public would have the opportunity to respond to the Draft Environmental Impact Statement during the official comment period, and substantive comments would be incorporated into the Final Environmental Impact Statement. Consequently, environmental justice is not analyzed in further detail in this document.

CHAPTER 4 IMPACTS